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In This Issue . . .

Editorial

Articles

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LEXINGTON, KENTUCKY — With its population increased 31.8% in the past eight years, this thriving city has had to provide for an 87% increase in its telephones in the same period. Lexington is in General Telephone Territory.

America's "best bet" growth areas

helped build America's second largest telephone system

Places that are creating 750 new telephone customers every day—as they are for General Telephone — are the places to watch.

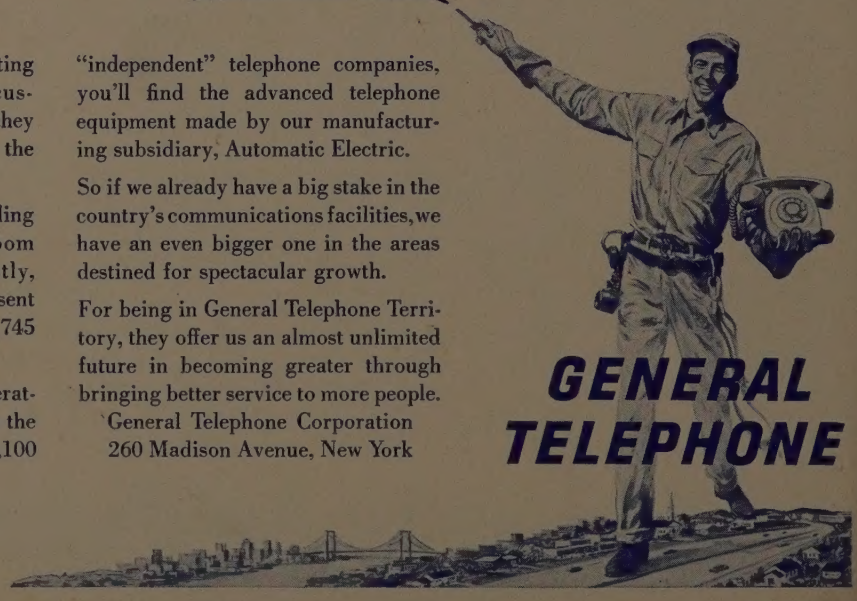
For that's where the nation is finding the room to house its mushroom growth. And that's where, mostly, General Telephone operates its present 3,359,000 telephones through 1,745 central stations.

You'll find General Telephone operating companies in 30 states. And in the central offices of most of the other 4,100 "independent" telephone companies, you'll find the advanced telephone equipment made by our manufacturing subsidiary, Automatic Electric.

So if we already have a big stake in the country's communications facilities, we have an even bigger one in the areas destined for spectacular growth.

For being in General Telephone Territory, they offer us an almost unlimited future in becoming greater through bringing better service to more people.

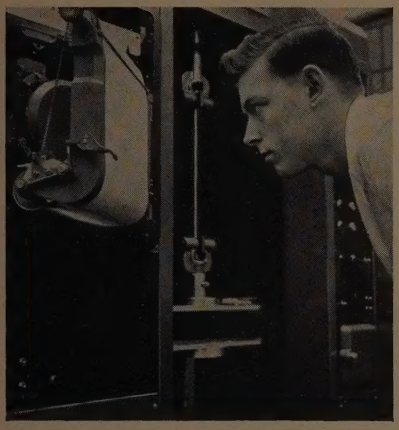
General Telephone Corporation
260 Madison Avenue, New York



GENERAL TELEPHONE

New developments in Celanese Plastics

Celanese research and development continue to feed new products to industry, and endow established products with new usefulness to create vast, new markets.



FORTIFLEX B...A NEW SERIES OF POLYOLEFIN MATERIALS

Now in commercial production at Celanese' Houston plant is the first of a new family of Fortiflex plastics which, together with the existing Fortiflex *A* series of rigid linear polyethylenes, provides a group of resins with an exceptionally wide range of properties.

...EACH TAILOR-MADE TO SERVE SPECIFIC USES

While the Fortiflex A series of polyolefins provides toughness, rigidity, and heat-resistance not previously available in polyethylene, each member of the new family of Fortiflex B plastics is tailor-made to offer the optimum balance of properties for the particular end-uses. Among them are monofilaments for rope and furniture webbing, wire covering, blown containers, paper coatings, film and pipe.

...TYPICAL OF "MADE-TO-ORDER PLASTICS" FOR INDUSTRY

And man's recently developed ability to create new materials with pre-determined properties and performance for specific end-uses is the continuing Celanese polyolefin research program, of which the Fortiflex B series is the latest product.

Celanese® Fortiflex®

Presenting industry with ever-increasing opportunities for new and improved products and services is a continuing Celanese program.

CELANESE CORPORATION OF AMERICA • 180 MADISON AVENUE, NEW YORK 16, N.Y.
CHEMICALS • PLASTICS • CHEMICAL FIBERS AND YARNS • CELLULOSE

Lockheed Management answers your questions about:

Lockheed's Diversification

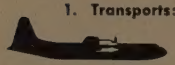
1. How many types of aircraft and missiles is Lockheed manufacturing or developing? What other activities is Lockheed engaged in?

Lockheed, long noted for its wide diversification, now has more projects in production or development stages than at any time in its history—thus increasing our resiliency and ability to adjust to changing conditions in the years ahead.

Lockheed Aircraft Corporation is composed of a team of autonomous operating divisions—each one specializing in certain fields and independently active in a multitude of endeavors that make up today's air/space industry. Lockheed's versatility in management and technical skills is, we believe, unrivaled in the field of flight.

Here is a partial list (restricted for security reasons) of Lockheed projects which are now in production or development stages:

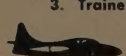
MANNED AIRPLANES



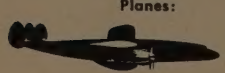
1. Transports:
- Passenger piston Super Constellation
- Cargo piston Super Constellation
- Passenger prop-jet Electra
- Airfreighter prop-jet Hercules
- Utility jet JetStar
- Prop-jet in-flight refueling tanker
- Prop-jet troop, missile carrier
- Prop-jet photo-mapping, air rescue
- Prop-jet drone launcher director
- Chemically-powered logistics
- Jet/prop-jet special air missions
- Supersonic jet transport study

2. Fighters:
- F-104A-C air superiority jet Starfighter
- F-104B-D two-seat jet Starfighter
- Jet all-weather interceptor
- Jet unmanned
- Jet fighter-bomber
- Close support attack

3. Trainers:
- T-33A jet
- T2V-1 jet SeaStar
- Jet and prop-jet navigational
- Jet and prop-jet electronic counter measure



4. Patrol Planes:
- P2V-7 piston-jet anti-submarine Neptune
- WV-2 & WV-2E piston flying radar stations
- P3V-1 prop-jet anti-submarine Electra
- Prop-jet flying radar station



5. Research Planes:
- U-2 high altitude
- P2V equipped for International Geophysical Year

6. Nuclear Plane:
- Nuclear-powered strategic bomber design
- Nuclear-powered logistics, patrol designs

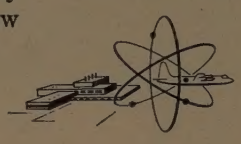
MISSILE PROGRAMS

1. Navy Polaris missile system
2. Earth satellite
3. Army Kingfisher target service
4. XQ-5 Air Force test drone
5. X-7A Air Force ram-jet test vehicle
6. Navy flight test rocket vehicle
7. Anti-Intercontinental Ballistic Missile (study program)

ELECTRONIC DEVICES

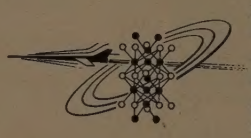
1. Telemetering equipment
2. In-flight recording devices
3. Training aids and simulators
4. Solid-state electronic devices
5. Data-link systems
6. Radar and beacon systems
7. Data reduction equipment
8. Antenna development

NUCLEAR PROGRAMS



1. Testing of nuclear devices
2. Industrial reactor design
3. Nuclear propulsion for missiles
4. Radiation effects on aircraft systems, equipment, and materials
5. Radiation shielding
6. Radioisotopes for industry

RESEARCH PROGRAMS



1. Man in space
2. Space communication laboratory
3. Ion propulsion
4. Gas dynamics under magnetic influence
5. Computing machine memories
6. Very high-speed aerodynamics
7. Human engineering and crew fatigue studies
8. Noise suppression
9. Materials and processes
10. Boundary layer control
11. Jet thrust reversal
12. Electromagnetic wave propagation and radiation
13. VTOL and STOL designs
14. Operations research and analysis
15. Chemically-powered supersonic bomber design

AIRCRAFT MODERNIZATION AND SERVICE

1. Maintenance, overhaul and servicing
2. Repair
3. Modification
4. Electronics maintenance and overhaul
5. Missile field service support

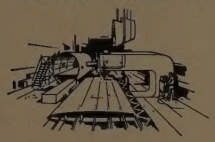
AIRPORT SERVICES

1. Operation
2. Aviation fuel distributorship
3. Maintenance base operation

MANAGEMENT SERVICES

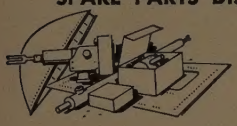
1. Airport management consultation
2. Aircraft production licensing and technical assistance
3. Aircraft/missile flight and ground crew training
4. Computer time
5. Nuclear operations management

MANUFACTURING SUBCONTRACTING



1. Tool design and manufacturing
2. Fabrication
3. Assembly

SPARE PARTS DISTRIBUTION



13,000 parts for commercial planes alone — in five U. S. depots

HANDLING EQUIPMENT

1. Passenger/cargo loading bridges
2. Aircraft/missile maintenance and ground handling equipment
3. Aircraft/missile test and checkout equipment
4. Mechanized cargo loading systems
5. Aircraft/missile flight and maintenance training aids
6. Aerial delivery systems

2. Is Lockheed's diversification paying off in increased sales and profits?

Yes. And it will continue to. Our drive for diversification in the past decade has brought significant sales in many new fields. Let's look, for example, at several areas in which we have expanded vigorously:

Missiles and satellites—first contract 1946... total sales through mid-1958: $289 million ...expected 1958 sales: over $200 million.

Nuclear energy—first contract 1951...sales through mid-1958: over $10 million.

Government research and development—from less than $6 million in 1947 to $26 million in 1957. Total postwar research sales: $157 million.

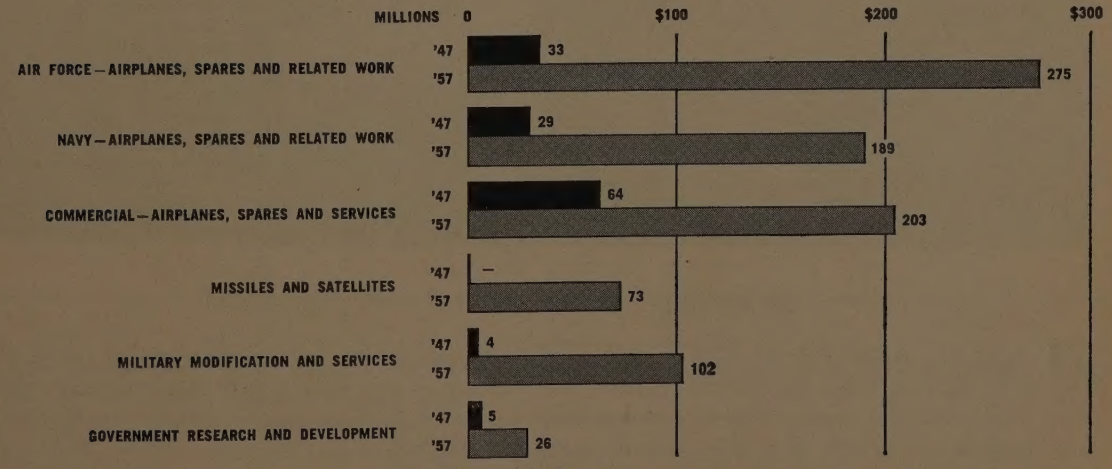
Airborne early warning—first radar picket plane flew in 1949...sales through mid-1958: $385 million.

Military modernization and service—1947 sales: $3 million...sales in 1957: $102 million.

Trainers—first trainer flew in 1948...sales through mid-1958: $506 million.

Out of the many advanced projects we are now developing will come exciting new contributions to human knowledge—and sales from sources undreamed of a few short years ago: commercial applications of missile and space travel technologies...radically new supersonic jet transports...harnessing of nuclear energy for industrial use...electronics applications... or from the whisper of an idea as yet unborn.

LOCKHEED DIVERSIFICATION: A COMPARISON OF 1947 VS. 1957



TOTAL SALES, 1947: $135 MILLION TOTAL SALES, 1957: $868 MILLION

LOCKHEED *means leadership*

All the comforts of home

A little bit of home flies with you when you take a trip on one of today's modern airliners. The friendly comforts . . . the small but important needs . . . are graciously and thoughtfully provided. No wonder so many people are flying.

Last year, America's airliners carried more than 42,000,000 passengers a total of 25 *billion* miles. Providing the fuels and lubricants to make this possible has been a big job for the petroleum industry. Texaco is proud of its part in this task—for during the last 23 years more scheduled revenue airline miles in the United States have been flown with Texaco Aircraft Engine Oil than with all other brands combined.

TEXACO

PROGRESS AT YOUR SERVICE

THE TEXAS COMPANY

TEXACO REG. T.M.

The Analysts Journal

AUGUST
1958

VOLUME 14
NUMBER 4

Helen Slade Sanders

HELEN SLADE SANDERS

THE passing of Helen Slade Sanders is in a very real sense a deep personal loss to those of us who were privileged to work with her. Her sincere and sympathetic concern for the affairs of her friends will be greatly missed, as will her depth of understanding and readiness to help which have bolstered many of us when the going was rough. But Helen's heart and mind were not alone for her close associates. Her indefatigable championing of the analysts' cause, often verging on the fanatical, gained her the respect and affection of analysts everywhere.

There is no more fitting monument to her memory than this Journal of which we are all so proud. If so complex an enterprise as the publication of this magazine can conceivably be the product of one mind, the Analysts Journal is truly Helen's creation. It is impossible to measure and evaluate what Helen has done for us in this one undertaking. The frustrations and drudgery to which she was always exposed in this task never dampened her spirits. Failing health did not affect her interest and sense of responsibility. Only four days before Helen died she reported that the Los Angeles Convention Issue of the Journal was out and the current Journal 90% assembled.

Helen's concern for the fledgling analyst and "the old man of 45" was the subject of scores of her speeches and reports. As chairman of both the New York Society's and Federation's Placement Committees, she accomplished much in breaking down not only age barriers but also the far more sinister race prejudices. Her work in this field was recognized by Averell Harriman when he appointed her to the Governor's Committee of Fair Employment Practices.

We are profoundly grateful for all Helen has done for us. The sound foundation she has built will greatly lighten the burden of those who will carry on.

George M. Hansen

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to This Issue

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DAVID B. STONE, partner of Hayden, Stone & Co., has been active in financing several companies and participates in all phases of corporate finance. He presently serves as a Director of a number of corporations with particular emphasis on research oriented industries.

KAARE VARVIN is assistant editor and manager of the business weekly "Farmand", Oslo, Norway. He was, from 1941 to 1945, secretary of Brage Life Insurance Company.

JAMES J. QUINN, head of the financial consulting firm of that name, has been in the financial field since 1936. He specializes in aviation, and has directed numerous studies of both airlines and the aircrafts.

HELEN SLADE (Mrs. Henry Sanders) passed away while the August issue of the JOURNAL was being prepared, hence "Book Reviews" do not appear this time. The Editors wish to express their gratitude to Mr. Henry Sanders for his invaluable assistance under most trying circumstances.

Low telephone earnings do not mean low rates

Good telephone earnings do not mean high rates

Many years ago the Bell System pledged itself to provide the best possible service at the lowest possible price.

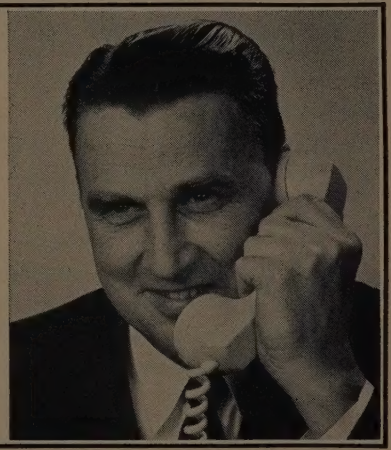
We meant it then and we mean it now.

Today, more than ever, it is evident that the best service at the lowest cost in the long run depends on good earnings.

To a considerable extent the public, and we are afraid many who should know better, have come to think that low earnings mean low rates and good earnings mean high rates.

Yet few people have the idea that the lowest earning soap company makes the best and cheapest soap.

The best service at the lowest cost in the long run depends on good earnings



Or the lowest earning meat packer makes the best and cheapest hams. Or that the lowest earning company in any line makes the best and cheapest products and renders the best service.

It doesn't apply to the telephone company either.

There are many ways in which telephone users benefit in both the cost and quality of service through good earnings for the telephone company.

BELL TELEPHONE SYSTEM

Will the Boom Resume?

ROBERT D. HEDBERG

HAVE YOU THOUGHT ABOUT 1960, 1961 and 1962? We are all in the habit of forecasting for six months to a year at a time, although frequently when reviewing individual stocks we are forced to estimate earnings three to five years ahead. This job is impossible without some assumptions about the broad economic background against which individual companies will be operating. The question to which I shall address myself is whether a resumption of vigorous growth is probable or even possible within that three- to five-year period.

After a review of investment in relation to Gross National Product, price levels, changes in debt, household formations and population make-up, sources of personal income, and productivity trends, we seem to be in the early stages of a major change in the nature of our economy. The needs of our population will have to be met in increasing degree by the state, local and Federal governments. Private spending will continue to be directed more and more towards services. Private capital formation will be a smaller proportion of Gross National Product. Corporate profits may be down considerably, while total production of goods and services is steady or rising.

The 1957 peak in business activity did not mark the high point of a business cycle. Instead, it was a year in which private capital formation, for a long time, lost its position as the most dynamic factor for making economic growth. If these conclusions are correct, it will be necessary to review those unspoken premises on which one bases reviews of investment prospects of corporations. Let us look at some factors that have led us to these conclusions.

INVESTMENT AND GROSS NATIONAL PRODUCT

We have seen in recent years the Canadian and Russian economies spending vary large percentages of their Gross National Products on capital formation. In the case of the Canadian economy, this was made necessary by the exploitation of raw materials for export. In the case of the Russian economy, standards of living or personal consumption are low and have been held down, so that a rapid increase in basic productive facilities could be made. In a sense, these conditions are similar to those in the United States for the twenty years prior to 1929.

During that period, our nation became electrified, the automobile industry developed and, though far less important, the radio and airplane were perfected. As a percentage of Gross National Product, private gross capital formation, according to the Department of Commerce, was as follows:

Years	Average Per Cent
1909—1913	17.2%
1914—1918	13.4
1919—1923	18.2
1924—1928	16.5

On the average, $1 out of $6 generated in our economy during this 20-year period was invested in capital goods. It was an extraordinary twenty years. The potential for change in the life of the nation that existed in 1909 has not existed at any time since then. In the seventeen years after 1928, the figures are far different. Figures prepared by the Council of Economic Advisers, including the calculation of depreciation, both corporate and non-corporate, have been compiled and are compared with Gross National Product below:

Years	Percentage of Gross Private Domestic Investment to Gross National Product	Percentage of Depreciation to Gross National Product
1929	15.5%	7.4%
1930—1934	6.1	10.2
1935—1939	10.0	8.2
1940—1946	7.7	5.5
1947—1951	15.5	6.0
1952—1957	14.7	7.0

The pre-1929 figures are not directly comparable and are less reliable than the later figures. Broad comparisons, however, can be made. The first conclusion is that either 1930-1946 represented a stagnation or we had gone through a long period of underinvestment, as compared with normal. The first alternative was accepted by many during the 1930's. It is not seriously contended now that our economy is stagnant, although my thesis is related to it in the sense that our growth or increase in the standards of living must change direction for a while. The second alternative, which is that we completed a long period of under-investment in 1946, implies that there was over-investment in the period prior to 1930 and likewise over-investment in the period subsequent to 1946. The rate of growth of plant capacity since 1946 corroborates this.

In the Department of Commerce study, "Markets after Defense Expansion", it is pointed out that, over the 42 years from 1902 to 1951, total output grew at about 3% per year, with productivity per man hour increasing at about 2% per year, the working day being shortened and the number of workers being increased to make up the difference. For the 1947-1951 period, output grew at a greater rate than 3% per year. From 1955 to 1957, apparently we have had a slower rate of growth.

As we stand looking from 1958 into the future, I believe there is nothing that compares in its possible impact with the automobile and electricity. Personal consumption of material things has reached a level from which it is more difficult for expansion to come. Instead, our needs are in the direction of better medical care, better housing for the minority of the population who live in slums, better education and, at the option of the population, more travel and more highly developed services of all kinds.

CAPACITY

The capacity and output of major materials* comprising slightly more than 10% of total industrial production has been compiled by the staff at the Federal Reserve Board. With output of these materials, average for 1947-1949 being 100%, capacity averaged as follows:

January 1	Output	Capacity for Production of Major Materials
1947	98%†	107.7%
1948	106 †	113.2
1949	98 †	118.6
1950	115 †	121.6
1951	125.0	128.9
1952	117.4	135.8
1953	130.6	144.3
1954	120.0	151.6
1955	141.7	156.2
1956	143.8	160.1
1957	143.3	166.4
1958	119.0**	176.1

†Estimated from charts.
**Preliminary, through May 1958.

Since 1947, capacity in these areas has increased at an average rate of a little more than 4½% compounded annually. A study of the figures indicates that capacity could be argued to be inadequate in the base period. Likewise, some of the materials excluded are important. Among the exclusions are lumber, glass, most industrial chemicals, coal and natural rubber, some of which are having lesser declines in this business slump than did the materials in the index.

The current gap between the index of capacity and the index of production is 10% greater than it was in 1949 or 1954. Thus it seems two conclusions are appropriate. First, a rate of investment of 4½% compounded annually has created an excess capacity. Secondly, both because our long-term growth rate is lower and because the demand factors are less strong, the rate of investment can be expected to decline.

HOUSEHOLD FORMATIONS

Let us look at household formation as one factor in demand for the period ahead.

Year	No. -MM-	Households Increase -MM-	Percentage Increase
1947	39.11	1.15	3.02%
1948	40.53	1.58	4.04
1949	42.18	1.39	3.41
1950	43.55	1.48	3.53
1951	44.66	1.01	2.33
1952	45.50	.90	2.02
1953	46.33	.83	2.0
1954	46.89	.56	1.2
1955	47.79	.90	1.9
1956	48.79	1.00	2.1

In March, 1957, the number of single males between 14 and 24 years of age was 8,470,000, but there were only 2,094,000 between 20 and 24 years old. This and other population data make it safe to predict that average household increase will fall further from the 820,000 average of the five years ending 1956 to 600,000 to 700,000 in the three to five years ahead. This makes an even worse comparison with the ten-year average of 1,080,000 annual increase.

By definition, a household includes all of the persons who occupy a house, apartment or room that constitutes a dwelling unit. Thus, this statistic, rather than family formations, indicates when the demand to furnish home or apartment will arise. It appears that vigorous demand for these things will not occur until the 1960's, perhaps by 1963 or 1964.

*Cement, petroleum refining, wood pulp, paper, paperboard, pig iron, steel, copper, aluminum, coke, cotton, synthetic textiles.

POPULATION MAKE-UP

Another way of saying the same thing to point up the change in demand in the United States is to cite the number of young and old in relation to productive workers. The following table illustrates that workers will care for more non-workers.

	Percent of Total Population	
	1954	Estimated 1960
Age 0—19 (male and female)	36.3%	38.9%
Age 65 and over (male and female)	8.4	8.2
Total	44.7%	47.1%
Males only, aged 25—60	22.0%	20.7%

It is not contended that males 25 to 60 are the sole support of the population, but this example illustrates the point.

We can safely predict that the relative demand for food, clothing, medicine, education, personal services, etc., will be good. Some of this demand will undoubtedly be expressed through Government activities; hence, increased taxes or possibly deficits. On the state and local level, both are a likelihood. In general, this type of demand is not served by big corporations.

For the longer term, 188 to 195 million people in 1965 means big demand.

SPENDING BY CONSUMERS

A tabulation of the nature of personal consumption expenditures, as shown on the following page, reveals some interesting changes.

Many of our recent increases in living standards and our projected needs are in the categories of spending for services rather than goods. Totals break down as follows for selected years:

	1939	1947	1952	1957
Durable Commodities	9.9%	12.5%	12.2%	12.5%
Non-Durable Commodities	51.9	56.4	53.2	49.9
Services	38.2	31.1	34.6	37.6
Total Personal Consumption Expenditures	100%	100%	100%	100%

In 1939, the gadget boom was foreshadowed, but had not arrived. In addition, demand for those things categorized as services is quite basic, so that in poor years its percentage of total personal consumption expenditures is high. We have come to regard higher spending for durables as normal

Certain Personal Consumption Expenditures

	1952		1956	
	MM-Dollars	% of Total	MM-Dollars	% of Total
Food and Tobacco	$75,181	34.4%	$86,367	32.3%
Clothing Accessories and Jewelry (inclu. cleaning, dyeing and laundering)	24,803	11.3	27,017	10.1
Personal Care	2,573	1.2	3,581	1.3
Housing (over 2/3 of this is imputed rent for owned dwellings)	25,563	11.7	32,841	12.3
Household Operation (inclu. utilities)	28,893	13.2	36,113	13.5
Medical Care and Death Expenses	10,501	4.6	13,405	5.0
Personal Business (financial, legal & insurance services plus interest paid)	9,380	4.3	13,968	5.2
Transportation	23,234	10.6	30,314	11.3
Recreation	11,374	5.2	13,844	5.2
Education & Research	2,319	1.1	3,565	1.3
Religion & Welfare	2,855	1.3	3,746	1.4
Net Foreign Travel and Remittances	1,652	0.8	2,399	0.9

in the post-war period. However, the outstanding recent trend, illustrated by both the earlier summary and the above detailed table, is the rise in the percentage of total personal expenditures going into services.

The price indices for these categories of expenditure are as follows, with 1947 being 100%: Durables 115%; non-durables 118%; services 138%. Many services are regulated and thus recent price increases reflect a catching-up process. Many other services are direct users of manpower, and the impact of higher wage levels cannot be eased through mechanization. Thus, the price of services probably will continue to rise somewhat faster than other things that consumers buy.

Because the non-durables in many cases are related to numbers of people, these also can be expected to rise about as much as consumer spending as a whole. It is hard to predict price trends for non-durables. However, there appears to be no reason to expect significant variation from the recent past, when the experience was about the same as with durables.

Durable goods buying on the other hand is related most often to household formation. Thus, we can conclude safely that a likely pattern is for the percentage of personal consumption expenditures going into durables to decline with services first and perhaps also non-durables getting the rising share.

DEBT

While Federal debt through 1957 was unchanged from ten years ago, state and local governments and private borrowers were increasing indebtedness rapidly. Debt of the former has tripled from a low base year, while the latter has grown at about 3% per year faster than Gross National Product and is $436 billion compared to $46 billion for state and local government debt.

We can expect the backlog of demand for municipal facilities of all kinds, widely estimated at $50 billion, to keep municipal debt increasing. At 1957 spending rates, this is more than four years of public construction in addition to normal year-to-year needs.

With this condition existing, a safe prediction is that the 11% to 12% per year increase in state and local debt (a $5 billion increase in 1958) will continue. Likewise, taxes will be increased to support this load and to pay the wages of people who will operate the facilities. Wage bills are regularly about two times construction expenditures for non-Federal Government units. The demand here rests most on more people and on more homes in places where there were none before. But, it also relates to such things as higher standards of medical care, bigger automobiles and highly developed standards of public responsibility for low-cost housing.

It is a reasonable prediction that non-Federal taxes will take a greater percentage of consumer income in the years ahead.

Private debt at the end of 1957 was 100% of Gross National Product. It can grow larger without unbalancing the economy. However, it is obvious that long-run disaster awaits if growth at 3% per year faster than Gross National Product continues. I cannot visualize national policy, even in our political economy, allowing this to happen.

PRICES

Increases in prices have been most uneven in the post-war period. In the consumer price group, the index of all items was at 123.3% of 1947-1949 in March of 1958.

Price Leaders and Laggers, as tabulated by the Bureau of Labor Statistics, were:

Groups of Consumer Prices
(1947—1949 = 100%)

Leaders	%	Laggers	%
Medical care	142.3	Household furnishings	103.9
Transportation	138.7	Apparel	106.8
Solid fuels & fuel oil	136.7	Gas & Electricity	115.9
Rent	*137.1	Reading & Recreation	117.0
Household operation	130.7	Food	120.8
Personal care	128.3		

*1947-49 low due to controls.

The leaders in post-war consumer price rises are in general the places where consumers are using the services of people almost directly. The doctor and nurse, the garage attendant and bus driver, domestic help, the barber and the laundry employee. But, business enterprises based on these demands have not been attractive investments. Of the price leaders above, only in the fuel oil business and Government-subsidized multiple housing has investment profitability been high.

With electricity as a notable exception, excessive capacity and competition characterize the groups that lagged in price.

Wholesale prices by commodity groups bear out the nature of price changes suggested. The Bureau of Labor Statistics reports all commodities at 119.7% of 1947-49 in March of 1958. Leaders and laggers were:

Leaders	%	Laggers	%
Metals & metal products	149.7	Miscellaneous	94.2
Machinery & motive	149.3	Textile & apparel	93.9
Rubber	144.6	Farm products	100.5
Non-Metallic minerals —structural	136.0	Hides, skin & leather	99.7
Pulp, paper & allied	130.5	Processed foods	110.7

Among the leaders, strong demand has made price increases possible, while profitability was maintained. There are exceptions, but the industries that make up the groups of leaders include many of the most profitable of the post-war period.

Once again, excessive capacity and competition are apparent in those groups that raised prices the least. (Miscellaneous includes jewelry, watches, manufactured animal feeds, notions, toys and sporting goods.) A few industries hold prices down and profitability up, but these are easily recognizable for rapid growth and increasing efficiency. They include drugs, electricity and many chemicals. Without need for high capital investment (or patentability), these characteristics can produce near disastrous results, i.e. for small plywood producers, television manufacturers and military electronics manufacturers.

For investors, the general suggestion in these figures is that ability to raise prices is associated with good growth in demand for the product. More moderate demand growth and ample capacity may indicate difficulties for some of our favorite industries.

Wholesale prices, excluding food products, were at 125 7% of 1947-49 in March of 1958. What is the price outlook for these industries which have raised prices far more than the average?

Iron and steel	167.3%
Paper	142.9
Tires and tubes	152.1
Construction machinery	165.4
Metal-working machinery	170.9
Electrical machinery	151.3
Metal containers	155.7
Building paper and board	142.5

A fair prediction is that some of these industries will be noted for the troubles they have with costs and prices in the next few years. It is a destructive inability to raise prices that investors should be alert for. Some excess capacity has existed at times in all of these industries in the recent past, with only electrical machinery, a very unlikely candidate, experiencing a price war. Such price wars for now seem to be out of fashion. On the other hand, the abundance of capacity in all these lines is likely to prevent price rises; and further, it may be a number of years for many of these industries before demand rises to the point of optimum use of capacity.

The Stock Market
Standard & Poor's 425 Industrials

Year End	Price Index	Yield	Ratio Price-Earnings
1935	12.77	3.26%	19.4
1936	16.50	4.09	17.9
1937	10.26	7.46	9.5
1938	13.07	3.48	23.2
1939	12.17	4.69	15.1
1947	15.18	5.39	8.9
1948	15.12	6.02	6.4
1949	16.49	6.94	6.9
1950	20.58	7.44	7.0
1951	24.73	5.98	9.5
1952	26.89	5.35	10.9
1953	24.87	5.91	9.6
1954	37.24	4.21	12.9
1955	48.44	3.87	12.8
1956	50.08	3.90	14.2
1957	42.86	4.52	11.7 (Prelim.)
1958 (June)*	48	3.96	14.5 (Est.)

*The figures for June of 1958 are for earnings and dividends estimated for the twelve months ending March 31, 1958. If recent quarterly rates were annualized, the price-earnings ratio would be substantially increased.

Are investors either forecasting good earning trends or buying something new like protection against inflation? Perhaps the whole post-war decade is being repudiated and we are going to return to the kind of capitalization of earnings levels and yields that prevailed in the 1935-1939 period. A certainty is that no deep depression is being forecast. It is also probable that both inflation and some recovery in overall economic activity is anticipated by investors.

I question whether adequate consideration of the possible depressants of corporate profits is being made.

QUALIFICATIONS

Possibilities for favorable developments in other areas of activity should be reviewed. Because my purpose is to accent the negative, and because of space limitations, I will only mention these other areas.

Total foreign investment has been 4% to 5% of Gross National Product, with a net export balance of about 1½% of Gross National Product in 1957. Both of these figures could be substantially increased. There are sound political, economic and philosophical grounds for government-business partnership through a system of guarantees to increase investment abroad and thus enlarge the outward flow of capital goods. At the moment, however, there seems to be a swing toward protectionism which will have the opposite effect. Little immediate hope exists here.

Technology must also be cited. The figures are poor, but there seems to be a rapidly increasing level of research expenditures, much of it government-sponsored and financed. Perhaps 1½% of Gross National Product will be going into a search for new things or improvements in existing products within a year or two. Much of the present effort has a military orientation with electronic guidance and detection systems, high energy (and thus far very costly) fuels and adaptions of nuclear and thermo-nuclear forces to wea-

pons being important. Some indirect benefits will come from this military research.

There are not many long-term major developments in sight. Eventual economic power from atomic energy promises fundamental changes in a number of areas of the world and in certain parts of the United States. For many years, this will probably not be a major development in the sense that it will change the way most people live. Electricity and the automobile did this in the United States and were certainly in the long term, major developments category. Rather, within the United States, research promises many significant but small improvements by these comparisons. Perhaps the automation of business paper work and the increased use of controls and power in production will enable us to have more leisure and require continued heavy capital expenditures to make this possible.

Defense efforts alluded to under technology probably will be a stimulating force in the national economy. Both population growth and increased state and local government spending have been mentioned as constructive forces in the aggregate of Gross National Product. These last two were also cited because their growth will produce some changed consumption patterns.

The other possible manner of increasing our consumption is through a shorter work week and greater leisure. This is often mentioned as an outstanding characteristic of America. Of course, it means the taking of increased productivity through means that involve no greater consumption. This phenomena is often accurately described as consuming leisure.

CONCLUSION

The chances appear for a depression in corporate profits that will last for several years. Certainly it will be a major mistake to generalize about the next two or three years on the basis of experience in the post-war decade! Because state and local government spending and defense spending will rise and become a more important relative part of the economy, there will be no serious general depression. Services, soft goods, travel and taxes are the dynamics with which we have to work. As a wise man said about 1958, so it appears will be 1959 through 1962—"There will be unusual opportunities for investors to lose money." We shall all have to have an open mind for new ideas and a willingness to examine our premises, though such is a tiring mental exercise.

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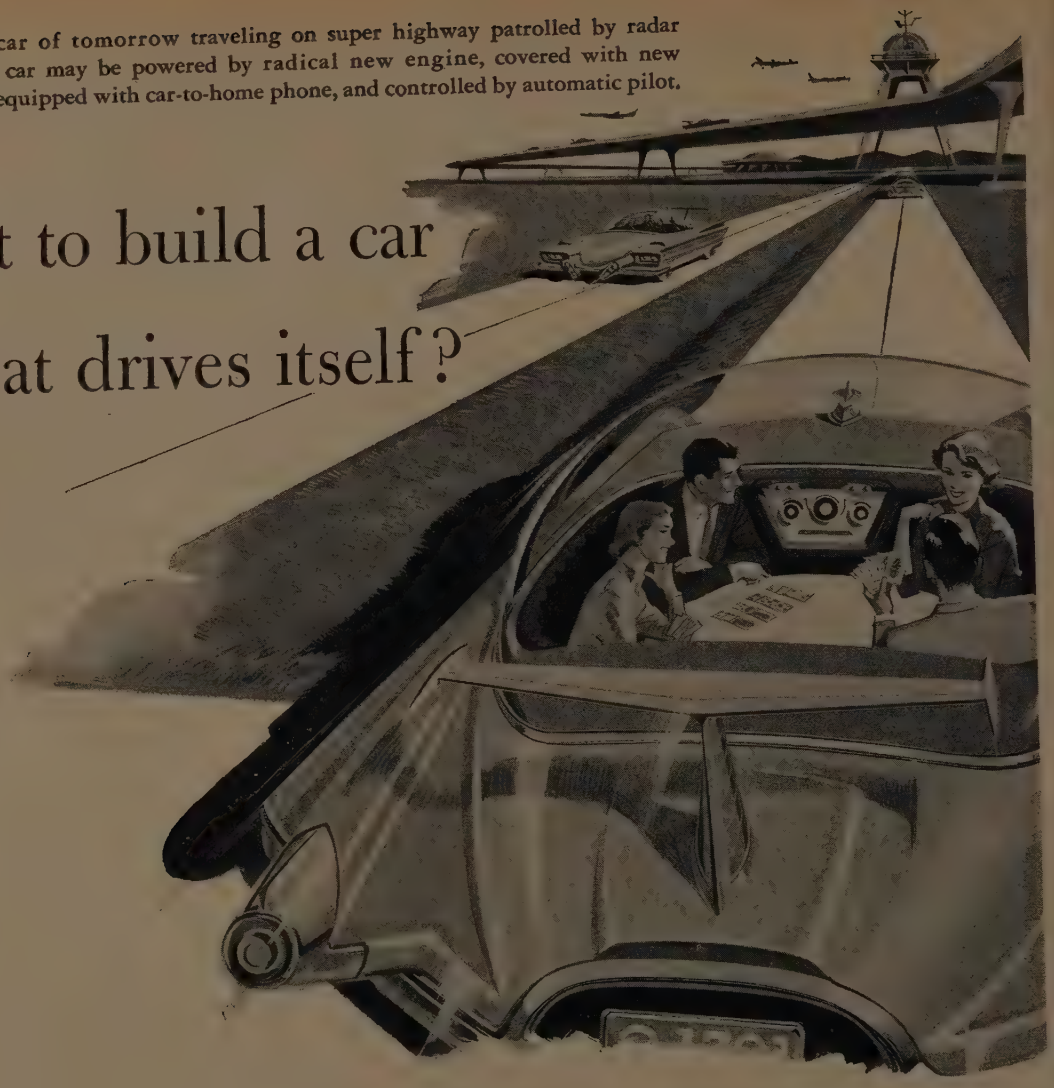

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Corporate Financing—The Investment Banker's Role

DAVID B. STONE

THE SUBJECT OF CORPORATE FINANCING is both broad and complex, so complex in fact that within space limitations of an article in the Analysts Journal, the problems at best may only be sketched in broadest outline.

There are many reasons why a corporation needs to raise capital, either to build a new office, a new factory, new machinery to increase working capital, to purchase another business or to develop a new product.

There are many sources from which a sound company can obtain new money, from internally generated profits and depreciation cash flow, from banks, either the customary three to six months short term, or even on a longer term basis, a sale and leaseback of property and private or public sale of securities.

Once need for financing has been determined, with whom does the corporation discuss its financial problem? For short term purposes, the financial officer of the corporation needing funds contacts its commercial banker whose job it is to provide it with temporary capital. But for permanent or long term capital, the corporation turns for its needs to the investment banker, essentially a financial middleman, who brings together the sources of capital with those having a need for these funds.

The investment banker first must know the reason and the extent of the corporation's capital needs. Also required by the investment banker is the approximate time the corporation will need such funds. The investment banker's role is to bridge the gap between the corporation and the investor by creating the most effective method to obtain those dollars. His position, (the investment banker) like that of any other entrepreneur in a competitive economy, is strictly limited by the competition of the market place, i.e., by terms which might be offered by other investment firms.

THE RISKS OF UNDERWRITING

One of the investment banker's most important functions is to assure the corporation of a specified amount of capital, irrespective of unforeseen developments such as changes in money rates, outbreak of wars, etc. In this underwriting operation the investment banker must of necessity assume the entire risk of the undertaking for he purchases the new securities from the corporation at an agreed price, to be furnished the corporation at a specified time. In following such risky procedures, the investment banker commits his own capital only because he feels he can re-offer the securities at a price which will ensure him of an adequate profit. If his judgment is correct, the issue is quickly sold to investors. If, on the other hand, he either has misjudged the market or if unexpected financial developments have altered previous financial relationships of various groups of securities, then the investment banker suffers either a serious loss, or, alternatively he has to carry such securities in his inventory for an indefinite period until changed conditions will enable him to be bailed out from an unprofitable deal. The underwriter's compensation for the risks assumed including other services performed is the spread between the price paid by the investor and that paid to the corporation.

EXPERIENCE IN THE SECURITIES MARKET

In a public offering, a function of the underwriter is ensured wide distribution of the new securities. This is the area where he calls upon experience in the securities market and the knowledge gained through daily contact with individual and institutional investors to give him the confidence that an issue of a certain size and price can be placed successfully in the hands of investors.

Still another function of the investment banker is the agency function, which most frequently takes the form of private placements. Here the investment banker formulates terms, locates buyers, prepares the necessary papers, at the same time advising the corporation which type of security is best suited in the light of its existing financial structure. He may act also as agent in other transactions such as the purchase and sale of companies, and particularly in the sale of stock of privately owned companies, which is a great help in establishing a value for such securities for tax purposes.

How does a corporation select an investment banker? For investment bankers differ greatly in the type of facilities they offer. Some major firms are wholesalers and distribute only to institutions and to other investment firms, while others maintain large distributing organizations that sell to all types of investors. A company's commercial banker will be of great help in establishing contacts with whatever type of firm is desired. If a firm national in scope is desired, in all probability such a firm will have its headquarters, or at least an important office, in New York. The corporation should approach several of these investment banking firms and discuss their financial problems with each. But the corporation should not shop its wares—any one firm will try to help and advise as to the best route for successful consummation of a financial operation. But should the investment banker suspect the corporation of talking with other firms, he may immediately withdraw from the scene, for he does not want to be in the position of having his ideas pirated by a competitor.

Generally, if the corporation is strong and well established, ability to raise capital is greatly simplified. If the corporation is using an investment banker for the first time, its financial officers should seek out the services of a well recognized firm, and discuss its needs frankly. Such a firm will advise the corporation whether or not it can be of service, and if for any reason it cannot function as a supplier of capital, other firms may be recommended as being in a position to occupy such a role.

The tests each investment firm applies in agreeing to

underwrite individual deals vary slightly, but in general, there are certain basic principles sought after.

First, appraisal of management is most important. The investment banker looks for experience, depth, and reputation for integrity. For it must be remembered that once an underwriting agreement is entered into, the name of the investment banker will henceforth be linked with that of the corporation. Accordingly, management integrity and ability is checked thoroughly through several sources, as is their record of achievement.

Secondly, the company to be financed should be a going concern, should have some prominence in its industry (not in size alone) and should have survived its early critical years. The exact measurements applied here cannot be rigid, since some industries offer such exceptional growth prospects, that no general rules may properly be applied.

Thirdly, and by no means least important, the investment banker will check the financial history of the business with a view of ascertaining whether it is a sound, well-managed company with a satisfactory earnings record, and whether there are prospects of an increase in earnings by reason of the addition of new capital.

It may be appropriate to touch on one or two fundamentals of our economic system. The profit or loss incentive is still the governing factor in appraising capital risks. Certainly the potential return on an investment should be related directly to the amount of risk taken. While many investors are interested in the securities of recognized credit standing and stature in their industry, there are investors who are able and willing to invest in smaller companies which show considerable promise. None of the corporate giants of today would be in existence had it not been for the far sighted financial sponsors who stood behind them in their early stages of development. On the other hand, no investor today should invest in any security unless he is fully prepared for the risks involved. If he is, his return on invested capital also should vary in proportion to the risks undertaken.

The subject of small business (a relative term, incidentally) financing has received much attention from businessmen, financial specialists, governmental agencies and leading political figures. In view of much misunderstanding on this subject, it may be a surprise to some readers that for some time past we have been entering a stage of vastly increased and keen competition in financing smaller businesses and that this competition undoubtedly will increase over coming years. It appears essential for the economic well-being of us all that we do everything possible within the framework of a free society to encourage the growth of promising enterprises which involve a host of new products, new technologies and new employment opportunities.

THE IMPACT OF TAX LAWS

In this connection, the impact of federal tax laws can scarcely be ignored as taxes affect all business activity and, consequently, the level of employment. The United States Congress has given and is giving considerable attention to the effects of tax regulation on small business. Reference is made to an article appearing in the U. S. News & World Report on May 30, 1958.

"Small businessmen in this country are to get tax relief and a new avenue to long-term loans and equity capital, if Congress approves a plan urged last week by Secretary of Commerce Sinclair Weeks. Mr. Weeks in his testimony recommended that Congress:

"Encourage investment in small firms by liberalizing tax deductions on losses taken in such investment. Right now, capital losses can be charged to ordinary income only in a limited way. The plan is to allow 'ordinary loss' deductions up to $50,000 a year for new investment in small firms-companies with a paid-in capital of a half million dollars or less and a net worth of one million dollars or less.

"Let taxpayers use faster tax write-offs for depreciation of used machinery and equipment. 'The life history of most new businesses,' said the Secretary, 'starts with used equipment.'

"Give small corporations the privilege of being taxed as partnerships. This idea is to let small firms adopt a corporate status without its tax disadvantages.

"Offer a 10-year stretch-out for payment of estate taxes where an estate is made up largely of investments in closely held firms. Its purpose: to avoid the sale of firms to pay estate taxes.

"Create a new system to provide small firms with long-term loans and equity capital. Funds would come from new 'investment companies,' which would be set up with private capital but would get loans from the Government. These investment companies and their own stockholders would get to deduct against their ordinary income all the losses they sustain in these operations.

"This plan is given a good chance of adoption by Congress this year."

Such support from the Federal Government, particularly in encouraging private citizens to find a solution to financing worthy enterprises, deserves the most serious backing and consideration by every citizen, since most businesses in our country are relatively small. There are approximately 1,600 corporations whose securities are listed on the New York Stock Exchange, for example, compared with an estimated 50,000 corporations whose securities are traded in the over-the-counter markets or are privately owned. Looking to the future, the investment banker will play an important role in assisting many of these smaller companies to become large important enterprises, as so many have grown over the past twenty years or more, and we may be confident that they will play an important role in helping in the solution of the capital problems of this vital segment of our economy.

A Note on Behavior in the Stock Market

E. F. RENSHAW

WITH THE ADVENT of fiscal policy which taxes dividend income progressively more than capital gains income, the attention of many investors has quite logically been focused upon securities which offer possibilities for capital gains.[1] Growth stocks have taken on a special glamour and come into vogue with the field of security analysts. Today it is virtually impossible to pick up a current issue of the *Analysts Journal* without coming across at least one article on the subject. It would seem that the average investor in quest of capital gains is neither cognizant of the fact that the ability of investment houses to pick growth stocks is in doubt, nor aware that recognized growth stocks may be so over-priced in terms of current earnings that it is "speculative" indeed to expect their future price inflation to be greater than the price inflation of representative industrial averages.

Terence Adderley, in comparing the performance of five selected growth stock portfolios during the years 1939-1955, has demonstrated that in four cases out of five growth stock selections have not outperformed the Dow Jones Industrial Average.[2]

Since the selection of growth stocks as a means of increasing capital gains is in doubt, there exists a temptation for the more informed investor to consider seriously the purchase of securities which have the reputation of being "speculative" and of lacking "investment quality."

Over the years a great deal of attention has been focused upon the investment merits of low price common stocks and stock purchase warrants. These investment media have traditionally appealed to speculators and the not-so-conservative investor for the seemingly logical reason that the magnitude of conceivable capital appreciation is so much greater than the possible loss. Any number of studies[3] and observations can be cited as indicating the attainment of extraordinary capital appreciation from shouldering, at an optimum time, the risk and uncertainty which is associated with what Molodovsky[4] has termed the "vision" stocks of marginal enterprises.

A NEW YORK EXCHANGE STUDY

A study made by the New York Stock Exchange showed, for instance, that out of 74 listed common stocks which advanced 60% or over in the first nine months of 1944, approximately 80% were in the price group under $10 per share.

Barron's original index of 30 stocks selling under $5 in 1938 was discontinued in May of 1946 after it advanced to a level where "low price" was a misnomer for the group.

Harry Comer, in an attempt to test the significance of the "square root rule," which states that bull swings tend to add equal increments to the square roots of stock prices and conversely subtract equal increments during bear swings, has concluded that the rule seems to apply well to groups of stocks but not necessarily to individual stocks.[5]

Paul Hallingby, after investigating the behavior of warrants during the bull market of 1942-46 and its subsequent decline, concluded that, "long term stock purchase warrants again demonstrated their tendency to fluctuate a great deal faster than both the common stocks on which they represent a call and the Dow-Jones Industrial Average."[6]

In order to counterbalance the enthusiasm that might have been engendered by the preceding statements, a few words of caution should be noted. Two of the most eminent students of security analysis, Graham and Dodd, are willing to contend that most buyers of low priced issues lose money.

> The pronounced liking of the public for "cheap stocks" would therefore seem to have a sound basis in logic. Yet it is undoubtedly true that most people who buy low-priced stocks lose money on their purchases. Why is this so? The underlying reason is that the public buys issues that are sold to it, and the sales effort is put forward to benefit the seller and not the buyer. In consequence the bulk of the low-priced purchases made by the public are of the wrong kind; i.e., they do not provide the real advantages of this security type. The reason may be either because the companies are in bad financial condition or because the common stock is low-priced in appearance only and actually represents a full or excessive commitment in relation to the value of the enterprise.[7]

Assuming, however, that the investor makes a diversified purchase of low priced stocks and warrants from a representative list, for him to be confident of obtaining capital appreciation, he must either be adept at forecasting the trend in stock prices or have plans for holding his list of securities for a sufficient length of time that short run ups and downs of the stock market will not matter. Studies by the Cowles Commission have raised a great deal of doubt as to the ability of stock market forecasters to forecast.[8] Even more disturbing is a suspicion that the stock market can remain out of long run equilibrium for uncomfortably long periods of time;[9] our investor might well be dead before succeeding bull markets had restored the capital loss engendered by a bear market.

To the above criticisms should be added a number of logical, theoretical, empirical, and practical criticisms. One can question the representativeness of the studies with respect to how well they describe the overall behavior of the market, how well they reflect long run behavior, and how well they reflect the behavior of individual stocks. One can question whether an enlightened individual could or would have been able to behave in such a way as to take advantage of the implication that low priced stocks have "better" market action than high priced stocks. One can doubt whether there are grounds for believing that price behavior in the past is relevant in predicting future behavior.

On practical grounds, it goes without saying that an increase in expected appreciation can only be purchased with

1. Footnotes appear at end of article.

the assumption of a greater degree of risk and uncertainty. Even though low priced stocks and warrants can on the basis of average past experience be expected to out-perform high priced stocks, proportionately more individual low priced stocks will perish. The average investor with only a small amount of money to invest in stocks might find it either impossible or too costly to properly diversify his holdings. My own hostility to the idea that the relative price flexibility of warrants and low priced stocks might conceivably be harnessed, so that it works to the advantage of the investor rather than his detriment, vanished somewhat when I happened to review some of Macaulay's work for the National Bureau. Macaulay was fascinated, if not disturbed, by the relative upward drift of some indexes of railroad stocks as opposed to other indexes. For his purposes, it was necessary to reject certain kinds of indexes because they had a tendency to increase in magnitude at an unrepresentative rate. Although Macaulay notes implicitly that index numbers can be used to describe the "changing fortune" of an investor following different portfolio policies, he perhaps deliberately fails to note that the index numbers he was forced to reject may be precisely the index numbers of most interest to investors.

MATHEMATICAL DRIFT

Frederick R. Macaulay, in his classical study of *The Movements of Interest Rates, Bond Yields and Stock Prices in the United States Since* 1856, was intrigued by an index number problem which he chose to call "mathematical drift."

> Index numbers of stock prices that are weighted by "activity" are subject to a quasi mathematical drift. In periods of advancing prices there is a pronounced tendency for individual stocks to be abnormally active when they are advancing in price more rapidly than the general market. The opposite tendency—to be abnormally active when they are declining more rapidly than the general market during a period of general decline—is very much less pronounced. The reasons for these conditions are partly technical and partly economic; but, if individual prices are weighted in proportion to the changing turnover of the individual stocks, the net mathematical result is a pronounced upward drift in the index number during rising markets, accompanied by a much less pronounced downward drift during falling markets. If a stock moves from 100 to 120 during a short period of great activity (compared with the activity of other stocks) and falls back to 100 during a long period of relatively small activity, it affects the index number more while rising than it does while falling. It is theoretically possible for the price of each stock in the index number to be the same at the end of a period as it was at the beginning, and yet the index number show a pronounced movement.[10]

By way of illustrating an index which is often subject to mathematical drift, Macaulay compares four index numbers of railroad stock prices; see Chart 13. Each index is a chain number, constructed by chaining together 79 separate index numbers, each extending from one January to the next.

The indexes presented by the upper three lines on the chart (A, B, and C) vary greatly in their movements, but are free from purely mathematical drift. The index represented by the lowest line on the chart (D) is subject to violent mathematical drift.[11]

For our purposes index (A) is uninteresting because it does not tell how much better off an investor who has purchased one share of each stock will be in each succeeding period. The average percentage price change, which the geometric average measures, is misleading as an indicator of the net change in portfolio value in that different bases are being compared.[12]

Index (B) measures the changing fortune of an investor who began in any January by purchasing shares in each stock in proportion to the number of shares each railroad had outstanding, and in each following January rearranged his portfolio (without cost of rearrangement) so that proportionality would be maintained. The weighting principle underlying index (B) bears a close relationship to the principle used in the construction of Standard and Poor's composite index of 500 stocks.[13]

Index (C) measures the changing fortune of an investor who began in any January by purchasing and continued to hold one share of each stock. The weighting principle underlying index (C) is comparable to the principle used in constructing the Dow Jones Industrial Average.[14]

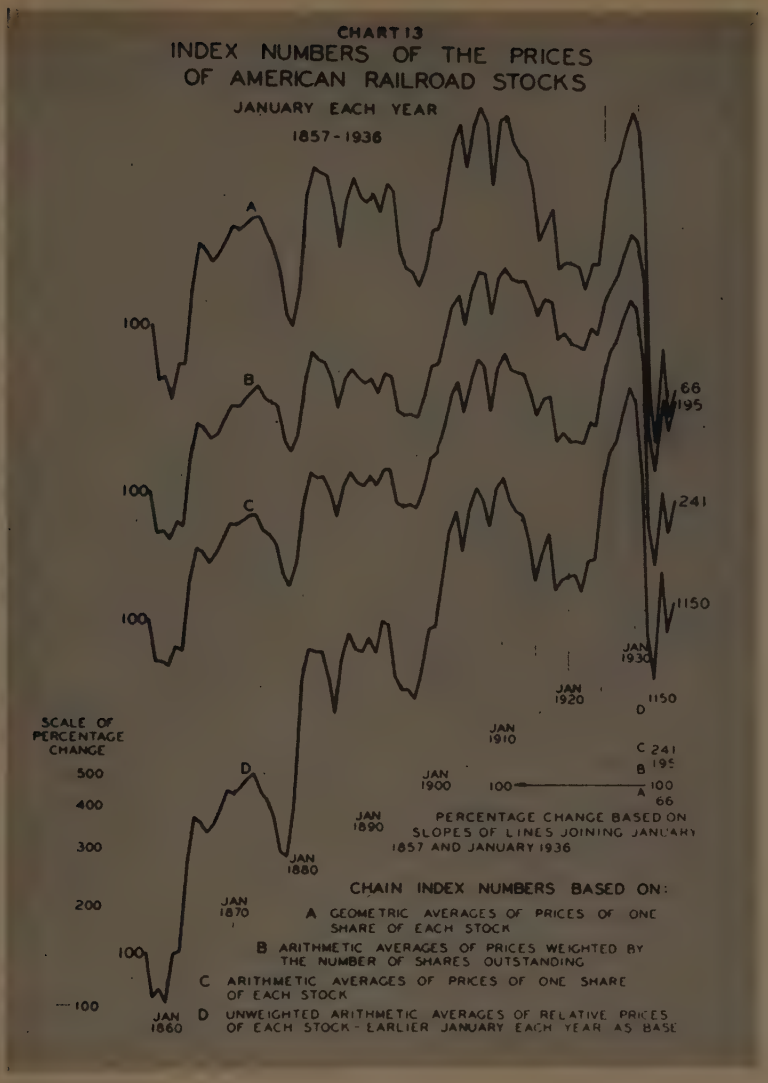
Index (D) measures the changing fortune of an investor who began in any January by investing equal amounts of money in each stock and, in each following January, rearranged his portfolio (without cost of rearrangement) so that once again the market values of his individual holdings would be identical. The weighting principle underlying index (D) is comparable to what in formula planning is often termed a constant ratio plan.[15]

A casual glance at Chart 13 reveals that over the entire period, investment plan (D) would have been far superior to either plan (B) or plan (C), and that (C) would have been preferable to (B); the price increase between 1857 and 1936 is from 100 in each case to 1150, 241, and 195 for indexes (D), (C), and (B), respectively.

The reason for the significant upward drift in index (D) is that during the four greatest upward surges of the railroad stock market, the lower priced and more speculative stocks enjoyed a much greater percentage advance than did the higher priced conservative stocks. The lower the price of the stock, the greater the number of shares used in index (D). As the price of a stock advances relative to the price of other stocks, the number of shares used in the index is reduced, lower priced stocks receiving greater weight.

The superiority of index (C) over index (B) can be largely attributed to the fact that railroads with high priced stocks had more shares outstanding and low priced stocks generally outperform high priced stocks.

While the performance of plan (D) is generally better than the performance of either plan (B) or plan (C), a careful examination of Chart 13 reveals that its superiority exists only in market upswings; either of the latter two plans would have been much more effective in the preservation of capital during market declines. In fact, it can be demonstrated on paper that thirty-one judicious switches between plans (B) and (D) would have increased one's initial capital (assuming zero transfer costs) by 7,980% as compared with 95% and 1050% for (B) and (C), respectively, alone. Whether an investor would have had the fore-



sight to change plans at the appropriate time, of course, is a question that cannot be answered. The idea, however, that an optimal switching between low and high priced stocks could have resulted in an accelerated rate of capital appreciation is suggestive. Behavioral rules might conceivably be formalized in the hope of taking advantage of relative price flexibility.

A naive approach would be to follow a plan similar to (D): invest proportional amounts of money in both high and low priced stocks and periodically adjust the investment portfolio to maintain proportionality. A refinement to this approach which has been incorporated into formula planning, is to make adjustments only when the degree of disproportionality has reached arbitrary percentage limits.

Whether a policy of proportionality adjustment will lead to desirable "mathematical drift," or in other words will outperform a policy of "buy and hold", depends on the nature of market fluctuations.[16] The more numerous the fluctuations in the relative price of low and high priced stocks, ceteris paribus, the more apt is a constant ratio plan to be the better plan. If low priced stocks were continually to increase relative to high priced stocks, proportionality adjustments would tend to remove the best gainers from the portfolio. If low priced stocks, on the other hand, were continually to decline relative to high priced stocks, proportionality adjustments would tend to put the worst decliners into the investment portfolio.

If better than average capital appreciation is to be expected under a constant ratio plan, it would be necessary to adopt rules which have the effect of delaying the sale of low priced stocks during market upswings and retarding purchases during market declines.[17] To be precise, optimum sales points are indicated when the ratio of low to high priced stocks is at a maximum; optimum purchases are indicated when the ratio reaches a minimum.[18] It is the rate of change in the ratio that is important, not its absolute level,

however. Essentially, one wants to own more low priced stocks when the ratio is increasing and fewer low priced stocks when the ratio is declining.

A modification to a plan which would keep proportional amounts invested in low and high priced stocks would be to allow the proportion invested in both categories to vary with the rate of increase or decrease in the ratio of low to high priced stocks. The most extreme plan would be to keep the entire portfolio in low priced stocks when the increase is positive and sell when the ratio levels off or decreases.

The hazard involved in using the ratio of low to high priced stocks, which has sometimes been denoted as an index of "speculative confidence,"[19] is that the rate of change in the ratio may not be stable from day to day; its future trend may be as undiscernable as the behavior of stock prices in general. Since there are costs associated with making portfolio adjustments, it would not pay to make an adjustment until there is evidence of a convincing change in the ratio trend. Before attempting to use the concept of a ratio of low to high priced stocks as a guide to portfolio management, one would surely want to study intensively the nature of its past fluctuations in terms of action signals.

At this juncture it should be made explicit that the author of this note makes no claim for having outlined a system that can be used effectively to "beat the market." Having no resources of his own to invest, he can afford the luxury of only being concerned with general principles rather than precise rules of operation, and for this reason he would be one of the first to criticize or be skeptical of such rules if they were devised. Furthermore, it is logical to assume that, if the author did have a sure-fire method of making money in the market, it would not be in his own best interest to publicize how it is done. Herein, I suppose, lies the reason why most of the free advice given on how to invest in the stock market is worth considerably less than one pays for it.[20]

My purpose in writing this note has been to present in an interesting and informative way the results of certain studies which are commonly overlooked by investors and students of finance. While my own predisposition heretofore has been to favor the development of security analysis, I would certainly be the last to maintain that there is no hope or justification for forecasting and market analysis.[21]

CONCLUDING REMARKS

In the body of this paper an upward drift in certain indices of railroad stock prices was noted. On the basis of this drift, it was suggested that statistical rules might possibly be found which would permit investors to harness the volitility of low priced stocks and warrants by a judicious policy of asset substitution. If the hypothesis is true that substitution rules can be devised for the attainment of above average capital appreciation over the course of market cycles, an implication, it seems to me, is that the rate of change in the ratio of high priced stocks to low priced stocks is an important variable explaining or determining the movements of more representative averages.[22] The ratio of low to high priced stocks might well prove of even more importance in explaining "The Dynamics of Share-Price Formation" than Tinbergen's rate of change in the industrial average itself.[23]

To me, the idea that the general level of stock prices can be explained in part by a derivative of relative price changes within the security market itself is quite disturbing, for it is logical to assume that if investors tried to get into low priced stocks in response to better market action, or conversely to get out of low priced issues in response to poorer market action, the effect on stock prices would be to make the move appear, for a time, all the more warranted. On the basis of a psychological reaction to previous price changes, the general market could be made to oscillate without rhyme or reason in relation to the real factors governing the fortunes and future income streams of the companies that are represented.

As an economist, interested on normative grounds in such things as price stability and a price system which reflects only the changes in real economic variables, it is somewhat chastening to think that an analysis of how people actually do behave could be responsible for introducing even greater imperfection into the security market. Such might well be the case, however, if one were to attempt to develop and distribute rules for taking advantage of relative price flexibility. While a diversion of resources in the direction of establishing substitution rules might be "rational" from the point of view of individuals, the end result as far as society in general is concerned could be quite irrational if a premium is put on price stability.

FOOTNOTES

1. The gain from an expected price increase can be offset in part, if not entirely, by a smaller dividend return. Price increases may be illusionary in that warrants and the most "visionary" low priced stocks usually do not pay dividends. Studies of relative price behavior usually overlook this compensating factor and are to be suspect from the standpoint of portraying the true gain which of course will be functionally related to both price increases and dividend rates and to the individual's tax bracket.

2. Terence E. Adderley, "The Investment Performance of Selected Growth Stock Portfolios: 1939-1955," Analysts Journal, November 1956.

3. See, for instance: Louis H. Fritzemeier, "Relative Price Fluctuations of Industrial Stocks in Different Price Groups," Journal of Business of the University of Chicago, April 1936, p. 133-54; Benjamin Graham and David L. Dodd, "Security Analysis" (New York: McGraw-Hill Book Co., third edition, 1951), pp. 563-74.

4. Nicholas Molodovsky, "The Core and the Margin," Analysts Journal, August, 1954, pp. 17-31.

5. Harry D. Comer, "Low Priced Versus High Priced Stocks," Analysts Journal, April 1945.

6. Paul Hallingby, "Speculative Opportunities in Stock Purchase Warrants," Analysts Journal, 3rd Quarter, 1947, p. 4.

7. Graham and Dodd, op. cit., p. 564-65.

8. See: Alfred Cowles, "Stock Market Forecasting," Econometrica, Vol. 12 (1944), pp. 206-14.

9. According to Graham and Dodd, op. cit., 1st edition, 1934, p. 22, the field of security analysis, "may be said to rest on a twofold assumption: first, that the market price is frequently out of line with the true value; and, second, that there is an inherent tendency for these disparities to correct

themselves. The second assumption is equally true in theory, but its working out in practice is often most unsatisfactory."

10. Frederick R. Macaulay, "The Movements of Interest Rates, Bond Yields and Stock Prices in the United States Since 1856" (New York: National Bureau of Economic Research, 1938), pp. 147-48.

11. Ibid., p. 148.

12. If one relative doubles, for instance, and another of equal importance falls to half its base value, the geometric mean will show no change, but the value of the investment portfolio will increase by twenty-five per cent.

13. See: Paul A. Smerling, "Found a Realistic Market Measure," Analysts Journal, May 1957.

14. Loc. cit.

15. For a discussion of the constant ratio plan, see: Lucile Tomlinson, "Practical Formulas for Successful Investing" (New York: Wilfred Funk, 1953), pp. 140-155; H. G. Carpenter, "Investment Timing by Formula Plans" (New York: Harper & Bros., 1943).

16. For an illustration of the results which hypothetically could have been obtained by holding proportional amounts invested in corporate bonds and the Dow Jones Industrial Averaging during the entire period 1897-1951 and five subperiods, see: Lucile Tomlinson, op. cit., pp. 146-150.

17. For a discussion of rules which have been suggested for delaying adjustments under the constant ratio plan, see: Carpenter, op. cit.

18. If there exists an expected difference in the rate of dividends paid per unit of time between low and high priced issues, prices should be theoretically adjusted before the ratio is computed by adding in dividends.

19. An index of speculative confidence is alleged to be of value in forecasting the trend in market averages; see: Nicholas Molodovsky, "New Tools for Stock Market Analysis" (New York: Nicholas Molodovsky, June 1947), pp. 49-72; Garfield A. Drew, "New Methods for Profit in the Stock Market" (Boston: Metcalf Press, 1951), p. 54.

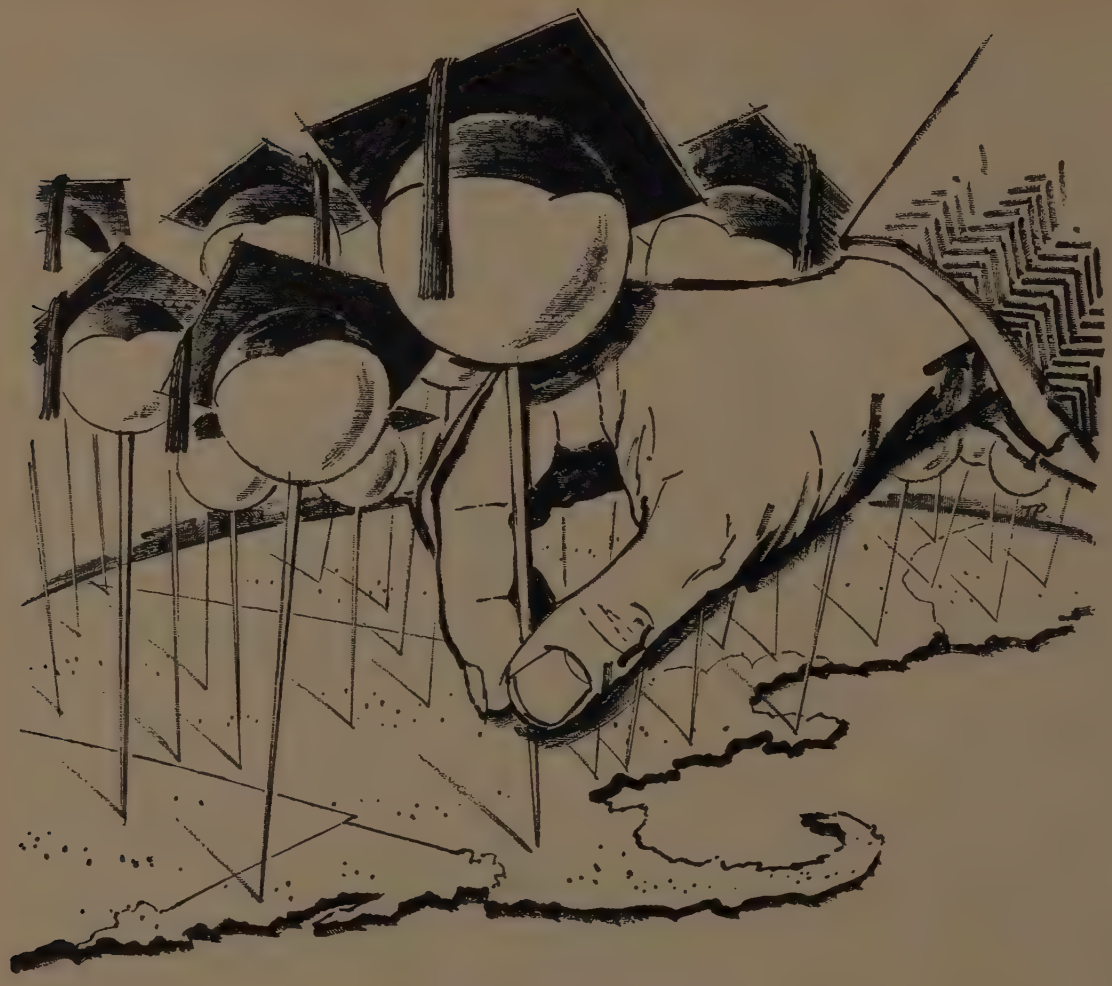
20. Since there are costs involved in making portfolio adjustments similar to the tax which is levied on parimutuel bets, the expected return to all systems involving known information about the track or the stock market is logically negative. By the time information becomes generally known, the odds or the price of stocks would have been adjusted to the information. Joseph Mindell in his book, "The Stock Market" (New York: Forbes and Sons, 1948) has a chapter on the reaction of the stock market to information. He notes the difficulties involved in establishing a connection between information and the behavior of stock prices and points out that anticipated information is often discounted so far in advance that a reaction opposite to what might be expected sometimes occurs when news is officially announced.

21. Edward F. Renshaw, "Foundations of Security Analysis," The Analysts Journal, January 1958.

22. The importance of a relative price variable in explaining stock market behavior has been emphasized by Nicholas Molodovsky, "New Tools for Stock Market Analysis," op. cit., pp. 58-62.

23. The Review of Economic Statistics, Vol. 21 (1939), pp. 153-60. For other investigations of the influence of past price changes on the market, see: Alfred Cowles and Herbert E. Jones, "Some A Posteriori Probabilities in Stock Market Action," Econometrica, 5 (1937), pp. 280-94; and L. C. Wilcoxen, "The Market Forecasting Significance of Market Movements," Journal American Statistical Association, 37 (1942), pp. 343-51.

Why all the activity in New England Electric?



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The Price-Future Earnings Ratio

A Practical Aid to Stock Valuation

W. EDWARD BELL

THE COMPLEX PROBLEMS involved in the valuation of common stocks fall primarily into two groups: (a) the determination of the future prospects of the issues under consideration, and (b) the valuation of these stocks in relation to their apparent future prospects. While an absolute determination of future value is impossible, much attention is properly being given to the *relative* valuation of common stocks. The skills of the analyst can effectively be applied to stock valuation on a relative basis. This involves careful estimates of the future prospects of the issues under consideration and, on this basis, an evaluation of their relative present market positions. So far as absolute valuation is concerned, the analyst is on less certain ground, but at the least he may be able to identify areas of extreme undervaluation or overvaluation.

ESTIMATES OF RELATIVE VALUE

The approach to estimates of relative value proposed in this article may be summarized as follows:

1. The future prospects of the common stocks under consideration are expressed in an estimate for each issue of the annual rate of growth of earnings per share.

2. The market position in relation to recent or current earnings is then evaluated in terms of the assumed rate of growth. For this purpose the writer proposes a new ratio, the price-future earnings ratio.

The conventional price-earnings ratio may be regarded as the number of years' earnings (at the recent or current rate) which are included in the market price. The *price-future earnings ratio* indicates the number of years' *future* earnings included in the market price, assuming for each stock an appropriate annual rate of growth of earnings per share. The approach is useful when there is a rational basis for projecting the rate of growth of earnings or where the characteristics of the stock are defined with sufficient clarity that such characteristics can be expressed through an assumed growth rate.

It may be objected that future growth is not constant and that, in any event, one cannot know the future growth rate. Nonetheless, assumptions with respect to future prospects are necessarily implicit in the relative valuation of common stocks. Where the characteristics of a stock are rather clearly defined, its prospects can properly be expressed in an assumed constant annual rate of growth of earnings per share.

All of the known characteristics of a stock can be reflected in the assumed growth rate. For instance, cyclical exposure, dependence on defense orders, and other factors which may be considered qualitative weaknesses can be reflected through an appropriately conservative assumed growth rate. The modification of the growth rate to reflect differences in quality is a subjective problem relying primarily on the analyst's experience and judgment.

The growth trend of earnings per share for the past five to ten years is a useful starting point for future growth projections. A simple technique for estimating the rate of past growth will be suggested later in this article. Having estimated the growth rate in recent years, one must then consider the extent to which this rate may have been affected by a rise or fall in the business cycle, price inflation or deflation, or other factors which may have a more moderate, more intensive or entirely different impact in the years ahead. Consideration must also be given to known new developments which are likely to affect future trends in the industries and companies under consideration.

It will generally be desirable to have a conservative bias in the growth rate projections, particularly where high rates are involved. The compounded error which would result from too liberal a projection can easily lead to purchases at speculatively high prices. A conservative approach will also reduce the risk of buying stocks at inflated prices which, while appearing reasonable in relation to past performance are not justified in the light of a company's possibly less dynamic future prospects. Much attention has been given to the frequently transitory nature of growth, and not infrequently today's growth stock may become tomorrow's income stock.

Well established growth trends of large, diversified companies have a strong tendency to persist. An increasing proportion of the nation's economy is conducted by corporations of large size which have broadly varied activities, aggressive research and product development, and a scientific approach to management. It seems probable that the relative characteristics of leading companies are tending to become more constant than they have been in the past. This is not to deny that one must be alert to anticipate those changes which would constitute the important and inevitable exceptions to this tendency. Subject to modifications justified by analysis of the past economic environment, by one's assumptions with respect to the future, and by industry and company developments, the rate of growth in recent years is usually a valuable guide or starting point in formulating an estimate of the rate of future growth.

While an assumed rate of growth can often be properly applied directly to recent or current annual earnings per share, at times this may not be appropriate. Perhaps current earnings are cyclically depressed or inflated, or earnings may have been in a plateau for several years to be followed by a sharp rise as new products, improved processes or expanded plant facilities become profitable. Allowance for such factors can be made either by adjusting the earnings base from which growth is projected or by an appropriate modification of the assumed growth rate. In either case

difficult problems of judgment are involved. Such difficulties do not invalidate mathematical techniques designed to improve rational judgments of value, but it is apparent that any formula is only as good as the assumptions and judgments with which it is used.

The following table shows price-future earnings ratios for several common stocks of good quality and differing growth characteristics. The assumed rates of future growth are presented for purposes of illustration. A change in the assumed rates of future growth or in present market positions in relation to earnings will, of course, result in different price-future earnings ratios, since the latter are a function of the two former factors.

Issue	Price-earnings ratio	Approximate growth rate, recent years	Assumed rate of future growth	Price-future earnings ratio
National Dairy	14	4%	3½%	11.6
American Cyanamid	18	10	8	11.6
Florida Power & Lt.	23	12	10	12.5
Minnesota Mining	34	15	12	14.3

The price-future earnings ratios shown in the above tabulation are readily determined by inspection of the table accompanying this article. One needs only to know the price-earnings ratio and to estimate an appropriate rate of future growth. As stated above, the price-future earnings ratio gives the number of years it will take for cumulative earnings per share to equal the current market price, assuming a constant annual rate of growth of earnings per share. The derivation of the price-future earnings ratios is explained in a technical note at the end of this article.

Note that whereas the price-earnings ratios in the above illustration vary from 14 to 34, the price-future earnings ratios fall in the narrower range of 11.6 to 14.3. Price-future earnings ratios reflect the market position in relation both to recent or current earnings and to growth prospects. In effect, the ratios isolate the growth element through virtual elimination, thus facilitating a direct comparison of the market positions of common stocks with varying growth characteristics.

A rather similar technique, which has been employed by a number of analysts and which is properly recognized as a useful aid to stock valuation, involves the ratio of current market price to earnings projected a number of years in the future, most often five years. For convenience, we will refer

PRICE-FUTURE EARNINGS RATIOS

Price-earnings ratio	Ratio of price to future earnings: Estimated annual growth rate of earnings per share													
	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	12%	15%	20%	25%
6	5.9	5.7	5.6	5.5	5.4	5.3	5.2	5.1	5.0					
7	6.8	6.6	6.4	6.3	6.2	6.0	5.9	5.8	5.7	5.6	5.4			
8	7.7	7.5	7.3	7.1	6.9	6.7	6.6	6.4	6.3	6.2	5.9	5.6		
9	8.7	8.4	8.1	7.8	7.6	7.4	7.2	7.0	6.9	6.7	6.5	6.1	5.6	
10	9.6	9.2	8.9	8.6	8.3	8.1	7.8	7.6	7.4	7.3	7.0	6.6	6.0	5.6
11	10.5	10.0	9.6	9.3	9.0	8.7	8.4	8.2	8.0	7.8	7.4	7.0	6.4	5.9
12	11.4	10.9	10.4	10.0	9.6	9.3	9.0	8.7	8.5	8.3	7.9	7.4	6.7	6.2
13	12.3	11.7	11.1	10.7	10.3	9.9	9.6	9.3	9.0	8.7	8.3	7.7	7.0	6.5
14	13.2	12.5	11.9	11.3	10.9	10.5	10.1	9.8	9.5	9.2	8.7	8.1	7.3	6.7
15	14.1	13.2	12.6	12.0	11.5	11.0	10.6	10.2	9.9	9.6	9.1	8.4	7.6	7.0
16	14.9	14.0	13.3	12.6	12.0	11.5	11.1	10.7	10.3	10.0	9.5	8.8	7.9	7.2
17	15.8	14.8	13.9	13.2	12.6	12.1	11.6	11.2	10.8	10.4	9.8	9.1	8.1	7.4
18	16.6	15.5	14.6	13.8	13.2	12.6	12.1	11.6	11.2	10.8	10.2	9.4	8.4	7.6
19	17.5	16.3	15.3	14.4	13.7	13.1	12.5	12.0	11.6	11.2	10.5	9.6	8.6	7.8
20	18.3	17.0	15.9	15.0	14.2	13.5	12.9	12.4	11.9	11.5	10.8	9.9	8.8	8.0
22	20.0	18.4	17.1	16.1	15.2	14.4	13.8	13.2	12.7	12.2	11.4	10.4	9.2	8.4
24		19.8	18.3	17.2	16.2	15.3	14.6	13.9	13.3	12.8	12.0	10.9	9.6	8.7
26			19.5	18.2	17.1	16.1	15.3	14.6	14.0	13.4	12.5	11.4	10.0	9.0
28				19.2	17.9	16.9	16.0	15.3	14.6	14.0	13.0	11.8	10.4	9.3
30					18.8	17.7	16.7	15.9	15.2	14.5	13.5	12.2	10.7	9.6
32					19.6	18.4	17.4	16.5	15.7	15.1	13.9	12.6	11.0	9.8
34						19.1	18.0	17.1	16.3	15.5	14.3	12.9	11.3	10.1
36						19.7	18.6	17.6	16.8	16.0	14.7	13.3	11.5	10.3
38							19.2	18.1	17.2	16.5	15.1	13.6	11.8	10.5
40							19.7	18.6	17.7	16.9	15.5	13.9	12.1	10.7
45								19.8	18.8	17.9	16.4	14.7	12.6	11.2
50									19.8	18.8	17.2	15.3	13.2	11.7
75										22.5	20.3	17.9	15.2	13.4

to such ratios, including price-future earnings ratios, as "price-growth ratios." All these ratios have a similar objective—the relation of market price both to current earnings and to growth prospects.

Using the four stocks in our previous example, it will be of interest to compare two of the price-growth ratios.

Issue	Assumed growth rate	Price-earnings ratio	(1) Price-future earnings ratio	(2) Price to earnings in 5 years
National Dairy	3½%	14	11.6	11.8
American Cyanamid	8	18	11.6	12.3
Florida Power & Lt.	10	23	12.5	14.3
Minnesota Mining	12	34	14.3	19.3

Based on the indicated market positions and assumed growth rates, ratio (2) suggests that Minnesota Mining is greatly overpriced relative to the other stocks; the price-future earnings ratio suggests a much more moderate degree of overvaluation. (For our present purpose it is irrelevant whether or not Minnesota Mining is fairly priced; we are concerned only with the usefulness of the price-growth ratios in relation to the assumptions.)

Using American Cyanamid and Minnesota Mining as the basis of an example, we can make a rough test as to the degree of relative overvaluation of the latter stock in relation to the assumed rates of future growth. For simplicity, both issues are reduced to a basis of $1.00 per share current earnings

	Stock with assumed future growth of 8% per year	Stock with assumed future growth of 12% per year
Price per $1 of current earnings (above table)	$18	$34
In 5 years $1 of current earnings will rise to	1.47	2.01
Price-earnings ratio in 5 years equivalent in both cases to 11 years' future earnings and if growth projection is unchanged	16½	21
Price projected in 5 years on above basis	$24¼	$42¼
Percent appreciation	35%	24%

As will be shown, the above assumption that the stock with the more dynamic growth rate of 12% would after five years sell at the same price-future earnings ratio as the 8% growth stock is very conservative. One might logically expect superior growth to be valued at a moderately higher price-future earnings ratio. Based on the assumed excessively severe decline in the premium accorded to the more dynamic stock, the above table suggests that a stock with 12% growth selling at 34 times earnings (price-future earnings ratio 14.3) may be moderately overvalued in relation to a stock with 8% growth selling at 18 times earnings (price-future earnings ratio 11.6). Bear in mind that the assumed decline in the premium accorded dynamic growth may have been excessive; we will return to this point. The writer suggests that the degree of relative overvaluation of the 12% growth stock is more fairly expressed by the differential in price-future earnings ratios (14.3 vs. 11.6) than by the ratios of price to earnings projected five years ahead (19.3 vs. 12.3).

Let us approach this problem from another direction in a further effort to compare the two types of price-growth ratios. Ignoring quality differences and current dividends in the interests of simplicity, we shall assume for the moment that stocks having various rates of projected growth should all sell at the same price growth ratio, of either series. As a base for the following computations, we shall further assume that an 8% growth stock sells at 18 times earnings, the position of American Cyanamid in the preceding example. We then have the following:

Assumed rate of future growth	(1) Price-earnings ratio if each stock sells at 11.6 years' future earnings	(2) Price-earnings ratio if each stock sells at 12¼ times earnings in five years
3%	13.9	14.2
8	18.0	18.0
10	20.2	19.7
12	22.6	21.6
15	27.1	24.6
20	36.5	30.5

The foregoing table reveals that price-growth ratio (1), the price-future earnings ratio, encourages the payment of a somewhat higher premium for growth than does price-growth ratio (2). The difference is rather superficial at growth rates up to 12%. For stocks with the most dynamic characteristics, use of ratio (2), which relates the current price to earnings projected five years ahead, has the not inconsiderable value of discouraging the purchase of dynamic stocks except at bargain prices. However, where future prospects justify the assumption of growth rates above 12%, an excessively conservative price-growth ratio will tend to thwart the analyst's purpose.

The validity of the price-future earnings ratios may be tested further by assuming purchases at prices justified by that ratio, as shown in the preceding table, then conservatively assuming that in the future dynamic growth prospects will be valued on the lower basis shown under ratio (2) in the table. For this test we will use issues with projected growth rates of 8% and 20%.

	Stock with 8% growth	Stock with 20% growth
Price per $1 of current earnings (equivalent in each case to 11.6 years' future earnings)	18	36½
Projected earnings in 5 years	$1.47	$2.49
Price-earnings ratio in 5 years on conservative basis of ratio (2)	18	30½
Projected price in 5 years	26½	76
Percent appreciation	47%	108%
Assumed dividend payout	60%	20%
Total 5-year dividends at same growth rate	$3.52	$1.49
Price in 5 years plus cumulative dividends	30	77½
Percent gain (appreciation plus dividends)	67%	112%

Assuming the growth rates are realistically projected, the table implies that a 20% growth stock selling at 36½ times earnings is at least as good a value, and probably cheaper, than an 8% growth stock selling at 18 times earnings. Thus, where growth projections are sufficiently conservative, the price-future earnings ratio does not seem to encourage the

payment of an excessive premium for growth. It is also clear that the introduction of an appropriate dividend factor does not materially affect this conclusion.

The following observations are suggested by the above test:

1. An approximation of the relative prices that are appropriate for stocks of various growth characteristics may be derived from price-growth ratios. Where several stocks are selling at identical price-growth ratios, of either series discussed, the prices of the more dynamic stocks are not excessive in relation to the prices of the less dynamic stocks.

2. The price-future earnings tend to result in a higher valuation of stocks with the more dynamic growth rates than do ratios of price to earnings projected five years ahead.

3. Where the projected rate of growth is considered a reasonable estimate of average prospects for a decade or more in the future, price-future earnings ratios do not encourage the payment of an excessive premium for growth. On the other hand, the ratio of market to earnings projected five years ahead may discourage purchase of the more dynamic stocks except at prices well below their fair value.

4. Where the growth rate is projected on a conservative basis or where the assumed rate of growth is expected to continue on average for many years, dynamic growth stocks may be worth a moderately higher price-future earnings ratio than less dynamic stocks. In other words, a stock with a high growth rate, soundly projected, may be worth more years' future earnings than a stock with slower growth.

It can be demonstrated that the ratio of market to earnings projected seven years ahead would result in conclusions not greatly dissimilar to those suggested by use of the price-future earnings ratios. Tables of price-growth ratios based upon earnings projected five or seven years in the future, similar to the table of price-future earnings ratios presented with this article, can easily be constructed.

MEASUREMENT OF PAST GROWTH

As suggested above, the growth trend of earnings per share in recent years is an appropriate basis or starting point for making projections of future growth, subject to such modifications as are indicated by changes in the economic environment and in the particular industries and companies under consideration.

Past growth can easily be estimated by visually fitting a trend line to a chart of adjusted earnings per share. Preferably, the chart should cover a period of at least a decade and should be on a semi-logarithmic scale. The trend line can reflect earnings for ten years or more or a shorter period, such as five to seven years, as desired in each instance. The analyst's judgment, experience and resourcefulness will have full play in making a measurement of the past that will have the greatest validity as a guide to projecting the future.

Regardless of the number of past years considered, to facilitate measurement it is suggested that the trend line be drawn to cover a period of ten years. The level of per share earnings at the beginning and end of a ten-year period should then be read from the trend line. The "normal" earnings at the end of the period are divided by the "normal" earnings at the beginning of the ten years. The average annual rate of growth of earnings can be determined through use of tables of compound amounts of 1 at various rates (see below).

Example: assume the trend line intersects the end of year 1947 at a level of earnings per share of $1.50, and intersects the end of year 1957 at earnings of $2.90. Dividing $2.90 by $1.50 gives 1.93. The table below indicates that the average annual rate of growth of earnings per share is slightly under 7%.

Compound amount of 1 at various rates of growth, period of 10 years—$(1 + i)^{10}$

i	amount	i	amount	i	amount
1%	1.105	6%	1.791	12%	3.106
2	1.219	7	1.967	14	3.707
3	1.344	8	2.159	16	4.411
4	1.480	9	2.367	18	5.234
5	1.629	10	2.594	20	6.192

The process of estimating the past growth rate can be further simplified through the use of a series of charts on segments of the same semi-logarithmic scale. A protractor-like device can be readily constructed which will enable the analyst to measure trends very easily on such charts without actually drawing trend lines. Upon request the writer will be glad to suggest a series of charts covering over 500 listed stocks which are ideal for this purpose and which are available at low cost. (A reasonable number of copies of the table of price-future earnings ratios will also be sent on request.)

TECHNICAL NOTE

Assuming a stock with current earnings of $1.00 per share and a 6% constant annual rate of growth, earnings will form the following series:

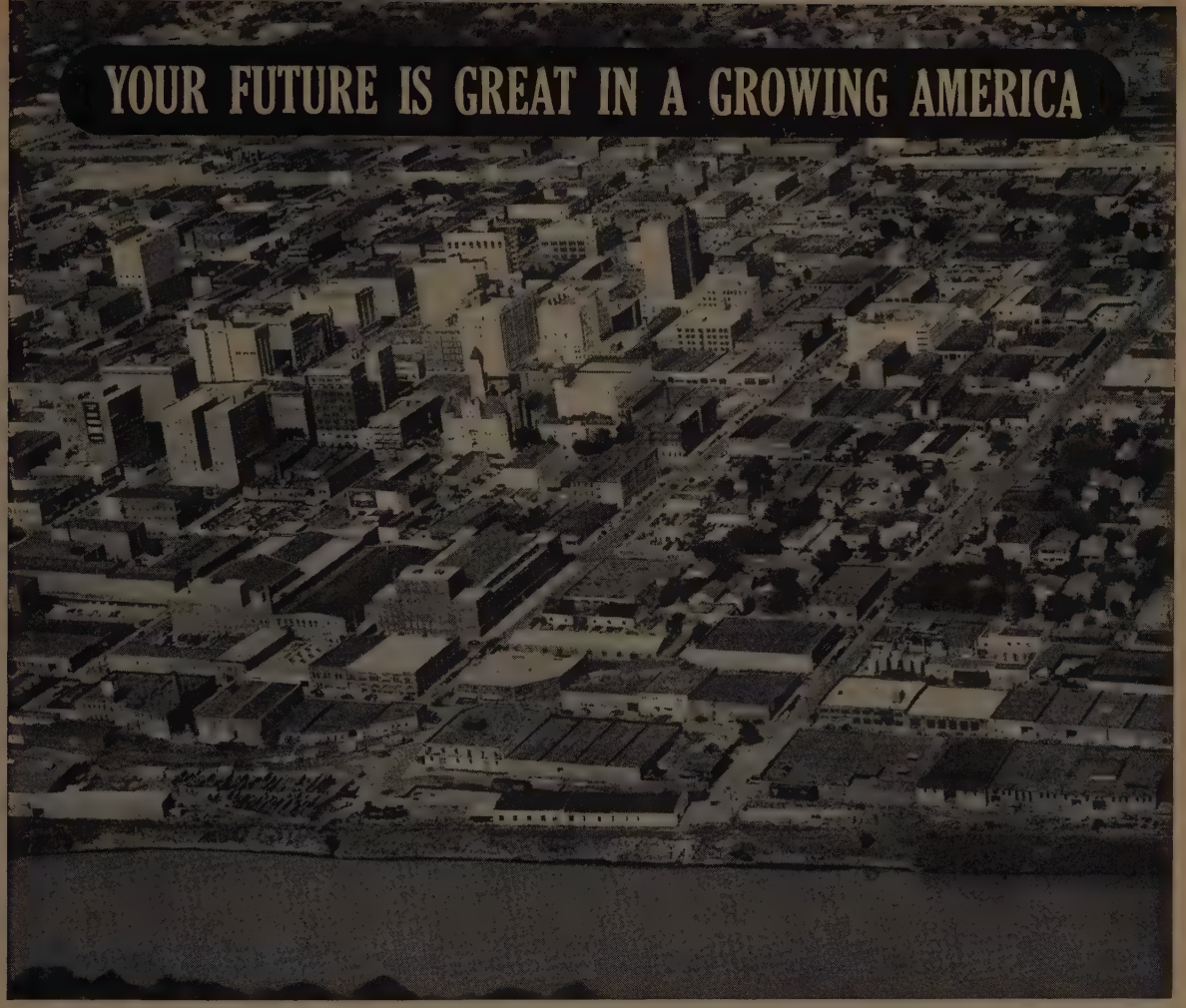
1st year	$1.000	5th year	$1.262
2nd "	1.060	6th "	1.338
3rd "	1.124		
4th "	1.191	Total	$6.975

Note that cumulative six-year earnings total $6.98, or approximately $7.00. If the stock is now selling at 7 (or 7 times current earnings of $1.00), cumulative earnings in six years will approximate the current market. Thus, at a 6% constant annual rate of growth of earnings per share, a price-earnings ratio of 7 is equivalent to a price-future earnings ratio of 6.

Note further that $6.98 (7) is the amount of an annuity of $1.00 at 6% interest for six years. Thus, where x is the price-earnings ratio, n the price-future earnings ratio, and i the assumed constant annual rate of growth of earnings per share, then

$$x = \frac{(1 + i)^n - 1}{i} \quad \text{and} \quad n = \frac{\log (ix + 1)}{\log (1 + i)}$$

(This is also the formula for the amount of an annuity of 1 for n periods at i interest.)



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3. **More income . . .** Family income after taxes is at an all-time high of $5300—is expected to pass $7000 by 1975.
4. **More production . . .** U. S. production *doubles* every 20 years. We will require millions more people to make, sell and distribute our products.
5. **More savings . . .** Individual savings are at highest level ever—*$340 billion*—a record amount available for spending.
6. **More research . . .** *$10 billion* spent each year will pay off in more jobs, better living, whole new industries.
7. **More needs . . .** In the next few years we will need *$500 billion* worth of schools, highways, homes, durable equipment. Meeting these needs will create new opportunities for everyone.

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This ad sponsored by Gulf Oil Corporation, Pittsburgh, Pa.

Progress Summary

Year Ended May 31	Net Revenue	Expenses	Depreciation	Interest	Income Taxes	Net Income	Cash Dividends	Retained Income	Earnings Per Share
	($000)	($000)	($000)	($000)	($000)	($000)	($000)	($000)	($)
1947	3,381	2,934	255	52	30	110	—0—	110	.18
1948	3,504	2,802	312	40	138	212	—0—	212	.34
1949	4,117	3,254	292	29	220	322	10	312	.52
1950	4,498	3,657	220	24	241	356	20	336	.57
1951	5,699	4,742	329	31	285	312	10	302	.50
1952	6,811	5,474	446	39	387	465	25	440	.74
1953	7,206	5,959	479	27	312	429	75	354	.69
1954	8,750	6,733	496	17	803	701	50	651	1.12
1955	9,926	7,672	635	20	761	838	360	478	1.31
1956	13,511	10,470	922	80	1,007	1,032	558	474	1.41
1957	17,250	14,064	1,076	138	970	1,002	306	696	1.31
1958	16,515	13,363	1,115	116	914	1,007	318	689	1.26

Progress Forecast

As our figures reflect, the spirit of industrial progress dominates the area in which we conduct our operations.

Projections for the state of Virginia indicate industrial and municipal growth resulting in increased construction activity to begin in 1959. The coming of the Chesapeake Bay Bridge Tunnel, redevelopment plans and major highway programs add further impetus to this new growth.

Henry Clay Hofheimer II

Chairman of the Board

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Marketing Research—A New Tool for Security Analysis

GEORGE G. OTIS

WITHOUT DOUBT a coming development in the security analysis field will be the use of *marketing* information to help predict the growth or decline of companies and industries, and the resulting stock movements.

By "marketing" is meant, simply, the process of getting a company's products into the hands of its consumers. Such activities as product design, sales operations, advertising, and retailing are some important examples of marketing processes.

For reasons that we shall see, the fortunes of most companies—and even industries—can be, and often are, drastically altered by events taking place in the marketing process.

And what is most important for this discussion is the fact that these marketing events occur well before any inkling of their effects appears in sales figures or other data readily available to the security analyst. If, therefore, there were a way of observing the events as they occurred and properly interpreting them in terms of their eventual influence on sales and profits, the security analyst would have an immensely powerful weapon to add to his arsenal.

Is there such a weapon? Indeed there is. It is not perfect by any means, and it probably never will be. But I venture to make the statement that, by employing it properly and in conjunction with the security analysis methods already used, present accuracy in predicting the sales and profits of our corporations could at least be doubled.

This weapon is marketing research.

Marketing research is a science which has been rather highly developed in recent years by manufacturers and advertising agencies for the purpose of gaining greater insights into this critically important marketing area. The trouble is that not nearly enough of it is done, and much of it is not conceived or used objectively. Too often it is directed at problems of less than fundamental significance. However, the techniques are there—in quite a high state of development—waiting only to be put to work by the qualified, objective analyst.

Let us examine, for a moment, just how crucially important this area of marketing is, and how it is often "botched" by intelligent executives. A few examples should suffice:

— After many years of unquestioned dominance in the low-priced car market, Ford was suddenly displaced by Chevrolet as the top seller.

— Cadillac did the same thing to Packard in the prestige car field some years back.

— In the less distant past, Procter & Gamble made a tremendous gain in competitive position, primarily at the expense of Lever Brothers.

— Some years ago the once well-known Piedmont cigarette faded rather abruptly into oblivion.

— The Servel refrigerator recently disappeared from the market-place altogether.

— The Ford Motor Company just spent millions of dollars to introduce the Edsel car, only to find that virtually nobody wanted to buy one. (Production figures for 1958 through August 2 showed Edsel at 7,627 compared to 16,070 for Lincoln!)

The reader can doubtless multiply the examples.

Why did these mysterious phenomena occur? In every case, the reason can almost certainly be found in the marketing area: a brilliant (or lucky) marketing move on the part of one company which was not countered by its competitor, or simply a bad marketing mistake by which the company's competitors gained without effort. In the case of Ford's decline, the reason was a tradition-bound refusal to recognize the importance of keeping up to date in product development and styling. Packard committed the error of tarnishing its prestige reputation by introducing a cheaper car under the Packard name. Procter & Gamble capitalized on a new product—detergents—while Lever Brothers, apparently fearing to hurt their soap business, made no marketing countermove. Piedmont, in an industry where consumer advertising creates almost the sole product differentiation, allowed itself to be out-advertised by competition. Servel made a serious error by changing its retail structure. This year's Edsel failed without doubt because its styling is out of tune with current public taste.

All of these gains and losses in competitive position could have been foretold, well in advance of any resulting stock movements by properly directed and interpreted marketing research.

At this point it would be well to define just what is meant by the term "marketing research." By "marketing research" I mean simply the systematic gathering of facts about the marketing process. Good marketing research develops facts which are relevant to marketing problems of fundamental significance.

Marketing research uses a wide variety of techniques. One of these, the consumer opinion survey, can show many things about the wants and needs, even including those that are subconscious, of the consuming public. This method can be used to find out consumer reaction to new products, new styling, or new packaging, as well as the effectiveness of new advertising approaches, before the new ideas are put into actual operation.

The survey method is used in the same way to produce facts about the industrial consumer—the purchasing agent and the plant engineer. It is also employed with persons in a position to influence the purchases of the actual consumer, such as the architect with his specifications, or the physician through his prescriptions.

Much valuable information can be obtained through research at the retail level. This can range anywhere from

measurement of consumer demand for newly introduced products or styles, to the evaluation of the competing sales organizations of companies within an industry. Retail research can throw a great deal of light, also, on the effectiveness of the competing manufacturers' advertising, packaging, and sales promotional efforts.

Marketing research also encompasses the study of available statistical data, such as sales by product, advertising expenditures, and the various economic indicators and industry statistics put out by the United States government. Such figures, in conjunction with information developed through surveys of the types mentioned above, can be pieced together to produce a much more complete and realistic picture of the present status and probable future of our companies than the companies themselves generally have.

It is important to realize that marketing research makes it possible to find out about all of these things long before they are reflected in sales or profit figures.

The reader will doubtless wonder why, if marketing research can produce such useful information, the manufacturers themselves do not use it to foresee all the things we have been talking about. The answer is that marketing research is too new a discipline to have gained the acceptance it merits. The proper use of marketing research will require major changes in the structure of our corporations and in the basic attitudes of those who manage them. These things take time. Meanwhile, there is nothing to prevent the security analyst from taking the fullest advantage of marketing research to predict the profits and losses of our companies as shaped by events occurring in the market place.

Let us consider more specifically how marketing research could be used with benefit by the security analyst.

Going back to our example of the Edsel car, for instance, we could have learned as early as Sept. 1957, through a rather simple consumer survey, that this year's model would not do well. Yet this fact did not become clearly evident until at least two months later.

Similarly, early consumer research, carried out the moment the new models became available, could have foretold the huge gain registered by the Chrysler Corporation in 1957, as well as the dismal showing of their "Air Flow" models of some years back.

What about the future of the small imported car and its United States counterpart, the Nash Rambler? Periodic consumer research could establish the size of the trend well ahead of sales figures. It would then be possible to observe which of the major American manufacturers take early advantage of the trend (assuming it is an important trend), and which do not.

Research at the retail level could have provided a strong indication of the disaster which overtook Lever Brothers. Talks with a few dozen retailers around the country shortly after Tide appeared on their shelves would have revealed the product's great potential long before it was felt in the Lever Brothers' treasury. A small consumer study to learn whether the first buyers of Tide intended to purchase it again would have confirmed the existence of the trend.

There is a device sometimes resorted to by corporate sales managers which can be deceptive to an outsider trying to evaluate a company's prospects. Frequently, in order to make a bad year look good in the annual report, the sales manager will use every device he can think of to load up his distributors and dealers with stock before the end of the year. In effect, he borrows sales from the next year, thus insuring that the next year gets off to a poor start, and making certain that the first quarter report is a poor one.

This sort of thing would be detected easily by surveys at the retail level, where it would be found that the year-end rise in factory sales was not matched by a similar upturn in the movement of goods to the consumer. Thus much could be learned by the end of a given December about a quarterly report not appearing until the following April or May.

Having discussed some specific areas where marketing research could help in security analysis, I would like to consider now what a complete marketing research program should encompass in order to be of maximum benefit in this field.

The first point to make is that, whatever studies are made, they should include an entire industry, not just an isolated company here and there. Usually, industries as a whole grow slowly, so that any rapid growth of one company must necessarily be at the expense of the others. To learn which companies are going to grow or decline rapidly, it follows that each one must be studied in its competitive context.

TYPES OF RESEARCH

The following paragraphs describe the main types of marketing research that would be useful for security analysis:

Product Research. In these days of amazing technological change, new products are rife on the market. Some are successes, but many are not. Some of the failures might have been successes had not a competitor come out with something better at the same time. Marketing research can keep a searchlight on this tangled, fluctuating process, and promptly feed the information to the security analyst. Depending on the products involved, the research might be done at the consumer, retailer, or industrial user level.

Styling Research. The fortunes of companies in several important industries are drastically affected by the success or failure of periodically introduced new styles or models. Predictions of how all the various competitive new offerings will fare can readily be made through consumer surveys, as we have seen.

Advertising Research. Much can be done here simply by studying the trends in the amounts spent by the various advertisers within an industry. Advertising plays a crucial role in maintaining competitive position, particularly in consumer goods industries. Yet it is felt to be an "intangible," and hence, in the name of economy, it is sometimes severely cut back. When a company, acting singlehandedly, does this, a loss of competitive position is bound to ensue unless there are compensating factors.

Right now many companies, suffering from recession jitters, are cutting down on their advertising. If this trend becomes serious, and if there should be individual companies which resist the tendency and maintain a high rate

of advertising expenditure, in the face of the lessened competition, watch for a spurt in their growth.

Beyond such studies of advertising volume, research can do much in the way of evaluating the effectiveness of the competing advertising campaigns. This research could take the form of studies at the consumer level, or simply the intelligent observation of the advertising by an experienced marketing analyst.

Research of Sales Operations. Like the advertising budget, sales operations are likely to be considered an "intangible" which it is hard for the company treasurer to evaluate in terms of a dollars and cents return. Consequently both are eyed when economy becomes the word of the day. Here economy can take two forms: a reduction in size of the sales force, or the initiation of an over-conservative policy on salaries. Either course spells a gradual loss of sales efficiency, and, later on, a decline in market share.

Valuable insights into this area could be obtained simply by asking the right questions of the managements of the various companies in an industry. The questioning would cover such matters as the numbers and locations of branch offices, numbers of salesmen, and pay scales. In order to establish trend information, which is the key to knowing which companies are on the way up or down, the questions would cover the history of these matters for several years back.

Additional information could be developed from talks with retailers as to the relative abilities and experience of the competing salesmen, turnover, and frequency of calls—again in a historical perspective, in order to establish trends.

Research of Wholesale Operations. In many industries the wholesaler organizations, although independent financially, are an integral part of the individual companies' sales operations. Growths and declines in the efficiency of wholesaler organizations can be learned through studies conducted at the retail level, as described above. In addition, changes in the composition of the wholesale organizations can be evaluated through the Dun & Bradstreet ratings of the wholesale firms involved.

Research of Retail Operations. This is important in industries such as automobiles and appliances, where there are exclusive dealerships. Again Dun & Bradstreet ratings of the retail firms involved would indicate whether a given company's retailing organization were on the way up or down. Beyond this, periodic consumer surveys can register opinion of the quality of services rendered by the respective competitive dealer organizations.

Investigations of Marketing Management. Until a few years ago, before the advent of marketing research, it was necessary for companies to make marketing decisions almost solely on the basis of subjective opinion. Most of the "facts" available were isolated reports from salesmen or other field sources, often exaggerated or misleading. Today marketing research makes it possible to substitute objective fact for opinion in many vital areas. What we are witnessing is a gradual transition of marketing from the status of an art to something approaching a science, through the application of research.

What this transition will mean in terms of increased efficiency in the marketing process is shown only too clearly by the many cases of gross inefficiency cited on previous pages. As of today, however, most companies are only in the beginning stages of the transition. Regard for the traditional ways of doing business have kept all but a handful of our executives from using marketing research to any thing approaching its full advantage.

But what is most important for us here is that some companies are progressing, and will progress, more rapidly in this direction than will others. Within an industry, the company that steps ahead of its competitors in the development and use of a sound marketing research operation is one whose market share will grow and whose stock will increase in value in the years ahead.

Many companies today have no market research; and decisions, as in the past, are still based on judgment, or compromises between conflicting judgments, aided or misled by reports from the field.

In many other companies there is a research operation, but it plays a limited role. Major marketing decisions are still made on the basis of the experience and judgment of old-time marketing executives. Here the general rule is to have the research function located somewhere under the wing of the chief sales executive, where it spends most of its energies on the pressing day-to-day sales problems that are his chief concern. Too often it is used merely to dig up ammunition to justify marketing strategies preconceived in the old way. I would say that most companies having any research are in about this stage of development today.

In the ideal marketing operation, research would be free to work, as science does, in an atmosphere of complete objectivity. It would be able to observe the marketing situation calmly and impartially, singling out the company's basic marketing problems. It would then proceed deliberately and systematically to produce the relevant facts that are the prerequisite of intelligent marketing action. Finally, the facts as developed would be used. This last requires an appreciation and understanding of research on the part of top management.

It should not be difficult to learn when individual companies in an industry make major breakthroughs in their progress toward this ideal situation. Periodic interviews with the managements of the competing firms by someone versed in marketing research should reveal any important changes in attitude toward this key tool for marketing success.

CONCLUSION

I should like to conclude this dissertation by citing an actual case history which illustrates very specifically most of the points that have been made. It shows how marketing research, by periodic and comprehensive observation of an industry, can do much to foretell the rise and decline of great corporations, years ahead.

The case is that of the sudden, rapid decline of a fine old company, which prior to the war was the leader in its industry, and the corresponding phenomenal growth of its major competitor.

Through 1950 this company's sales were excellent—in the neighborhood of $60,000,000 annually—and its finan-

cial position exceptionally sound. The most thorough analysis by the usual methods would have shown that its stock was an excellent buy. Today its sales lag far behind those of its major competitor; its stock is at one third the 1950 level; it is badly in debt; and omitted its last dividend. Recently it closed down permanently one of its major plants.

Yet signs of this impending disaster were beginning to appear for the skilled marketing analyst to read many years prior.

The first sign was the company's decision to reduce substantially its consumer advertising during the war, when it could sell all it could make without effort. Its major competitor, however, continued its consumer campaign at a high level. Obvious result: the competitor emerged from the war with the far greater consumer franchise.

In spite of this, however, due to a greatly expanded industry market, the company's sales remained good, although the competitor's sales zoomed sharply upward.

This industry happens to be one of the ones mentioned previously which depend heavily on the periodic introduction of new designs to follow trends in consumer taste. The subject company did virtually nothing along these lines during the war. Its competitor did. Result: when supplies became plentiful after the war, and consumers had a choice, many more of them turned to the competitor's designs.

Research at the dealer level even during the war period would have shown that most consumers preferred the competitor's designs, thereby further revealing the unprogressive tendency in this company's management.

Further dealer research beginning right after the war would have disclosed the emergence of a new product, which each year was cutting more severely into sales of the industry's traditional products. Yet the company, in loyalty to its traditional products, made only token efforts to get into this new business.

In 1951 an aggressive new management was put in, giving great promise of better things to come. It began a program of expansion by acquiring other companies, as well as by adding numerous new products. But the largest of the new plants purchased, which involved borrowing many millions of dollars, was equipped to make the traditional products, which research would have shown to have a declining market!

Although the company finally introduced all of the many new products now making up the industry, it failed to make corresponding adjustments in the size of its sales force. As a result, the existing salesmen had more items than they could effectively sell. This meant not only that full advantage was not taken of the sales potential of the new products. It also led to declining morale, since, if the salesmen concentrated on one product, they would be reprimanded for poor sales of others.

Again, marketing research at the retail level (or even the right questions asked of company management) would have disclosed the existence of such unfavorable conditions.

In spite of this ever more apparent evidence of the impending fall of a great company, all seemed well on the surface for a number of years. Sales remained at a good level (due to the larger total industry market, new products, and the inherited business of acquired companies). Profits declined somewhat, but dividends were paid. Then suddenly, in 1956, the stock market took cognizance of the realities—about 15 years after the first signs of decay began to appear.

The Science of Volatility

OAKMAN HOOD

THE TERM "VOLATILITY" is familiar to all, but its wide application in financial analyses is known to relatively few analysts.

This is a day of scientific developments, and in the field of financial research the scientists also have been active. One foremost development is the Science of Volatility which has produced a new tool to help in appraising the actions of individual stocks, stock groups, and the market as a whole. Heretofore comparatively little has been done to translate volatilities into exact figures with mathematical accuracy, and little has been done to understand and apply the functions of volatilities to the analysis of stocks and the stock market as a whole.

The generally accepted method of obtaining the volatility of a stock is to compare its percentage price rise or fall with the percentage price change of a market index, such as the Dow-Jones Industrial Average, over an appreciable market movement. Since such movements are generally very irregular as to timing, it is preferable to have a method for determining volatilities at regular intervals, such as once a month. Monthly volatility figures make it possible to establish trends and to make definite comparisons. These are advantages which can not be accomplished with figures produced irregularly.

A METHOD OF OBTAINING VOLATILITY FIGURES

Here is a method of obtaining volatility figures of a stock or stock group on a monthly basis: A 26-month moving average of the monthly per cent changes in the price of the Dow-Jones Industrial Average is taken as a base. A 26-month moving average of the monthly per cent changes in the price of a given stock is divided by the corresponding figure for the Dow-Jones Industrial Average. Twenty-six months is taken in order to counteract any seasonal effect which a two-year period might cause. The results obtained, which are solely from mathematical computations, are not empirical; they are exact.

VOLATILITY VS. SPECULATION OR INVESTMENT

The volatility of a stock indicates whether it is being used primarily as an investment for long-term holding or as a speculation for trading. This is how it works: A stock bought for investment is held out of circulation for a considerable time, thus automatically giving it a lower volatility. On the other hand, a stock used for trading is more active and thus automatically has a higher volatility. It is assumed that the stock in question has a large share distribution which precludes any action which could cause a thin market in the stock. This all means that generally a stock of low volatility is used primarily for investment, while a stock of high volatility is used primarily for trading.

By using volatility figures and comparing their trends and changes, it is possible to know the character of the "buying" and "selling", whether there is speculative buying or profit taking, or investment accumulation or distribution, in a given stock. Also, it is possible to know the amount of potential profit taking overhanging a given stock and whether this potential profit taking is increasing or decreasing. The details of these analyses are explained further on.

CHANGING VOLATILITIES

The volatility of a stock is always subject to change. This can mean that at one time it is used primarily for investment and at another time used primarily for speculation. As its volatility increases the speculative interest in a stock increases and it may become a primarily speculative stock. As its volatility decreases the investment interest in a stock increases and it may become a primarily investment stock. In other words, with an increasing volatility the trend is toward speculation. With a decreasing volatility the trend is toward investment. Furthermore, each stock bought and sold is used by some as a speculation and at the same time by others as an investment. Hence, in each stock there are both speculative and investment interests. The ratio of these interests to each other, that is the percentage of speculative interest and the percentage of investment interest in each stock at a given time, can be mathematically computed.

If a stock has a volatility of 100, it is 50% speculative and 50% investment. As its volatility increases above 100, its speculative interest also increases, while its investment interest decreases. It thus becomes a primarily speculative stock. As its volatility falls below 100, its investment interest increases and its speculative interest decreases. It thus becomes a primarily investment stock. A stock with volatility of 150 is 66.5% speculative and 33.5% investment. A stock with a volatility of 50 is 33.5% speculative and 66.5% investment.

Here are some examples of stock volatilities and the speculative and investment interests in each stock as of March, 1958:

Stock	Volatility	Class % Spec.	Class % Inv.
Aluminum, Ltd.	231	78.5	21.5
Bethlehem Steel	178	72.0	28.0
Chrysler	159	68.5	31.5
General Motors	124	59.5	40.5
Canada Dry	72	39.0	61.0
American Tobacco	62	36.0	64.0
National Biscuit	57	35.0	65.0
American Tel. & Tel.	44	32.0	68.0

VOLATILITY SHOWS THE CHARACTER OF THE BUYING AND SELLING

The volatility changes in a given stock—that is, the changes in the speculative and investment interests in a stock—together with the price changes of the stock, indicate the character of the buying and selling, whether it is specu-

lative buying or profit taking, or investment accumulation or distribution. The following rules give the meaning or interpretation of the volatility and price changes in a stock or stock group:

Rule 1. An increasing speculative interest or a declining investment interest, together with a rising price, indicates speculative buying; with a declining price it indicates investment distribution.

Rule 2. An increasing investment interest or a declining speculative interest, together with a rising price, indicates investment accumulation; with a declining price it indicates speculative profit taking.

The following example shows the practical use of these rules:

In September, 1957, Merck & Co. had a volatility of 159; that is, its action was 159% of the action of the Dow-Jones Industrial Average. At that time the interests in this stock were 68.5% speculative and 31.5% investment. As of March, 1958, Merck & Co.'s volatility declined to 146, or 66.0% speculative and 34.0% investment. Therefore, in six months the investment interest in Merck & Co. increased from 31.5% to 34.0%, a material increase. During this same period of time this stock's price increased better than 20%; that is, the price of the stock went up and its investment interest also increased. This action indicates, according to Rule 2, there was an appreciable investment accumulation of Merck & Co. during this six months' period—constructive action.

Volatilities naturally apply to stock groups as well as to individual stocks. Table I shows the volatilities of 39 leading stock groups, listed in the order of their volatilities. These volatilities are for April, 1958, and for March, 1958, for comparison. Also given is the speculative and the investment interests in each group.

Table I

Group	Volatility 1958 Apr.	Mar.	Per Cent Spec.	Inv.
Aluminum	294	280	83.0	17.0
Copper	193	193	74.0	26.0
Oil	181	178	72.5	27.5
Steel	180	180	72.5	27.5
Office Equipment	176	176	71.5	28.5
Mining & Smelt.	175	169	71.5	28.5
Gold	171	174	71.0	29.0
Drug	171	164	71.0	29.0
Rubber & Tires	170	166	70.5	29.5
Aviation—Trans.	168	169	70.5	29.5
Electrical Equipment	164	162	69.5	30.5
Building Equipment	162	163	69.0	31.0
Radio	159	162	68.5	31.5
Meat Packing	155	154	68.0	32.0
Machinery	146	143	66.0	34.0
Chemical	142	140	65.0	35.0
Aviation—Mfg.	139	142	64.0	36.0
Rayon	139	142	64.0	36.0
Auto Equipment	135	141	63.0	37.0
Paper	135	129	63.0	37.0
Insurance Stocks	133	133	62.5	37.5
Textile	125	125	60.0	40.0
Automobile	121	127	58.5	41.5
Rail Equipment	119	119	58.0	42.0
Rail	110	114	54.5	45.5
Sugar	109	106	54.0	46.0
Household Products	102	98	51.0	49.0
Grocery Chains	101	99	50.5	49.5
Farm Equipment	98	100	49.0	51.0
Financing Cos.	95	93	47.5	52.5
Mail Order	91	95	46.0	54.0
Amusement	90	97	45.5	54.5
Bank Stocks	85	83	43.5	56.5
Merchandising	79	81	41.5	58.5
Soft Drinks	78	79	41.0	59.0
Utility	75	77	40.0	60.0
Food Products	73	72	39.5	60.5
Tobacco	43	43	32.0	68.0
Am. Tel. & Tel.	43	44	32.0	68.0

VOLATILITY VS. THE STOCK MARKET AS A WHOLE

A knowledge of the character of the market as a whole is of constructive value. Volatility makes it possible to establish whether we are in a primarily speculative market or a primarily investment market. The following mathematical method is used to give these facts:

About 125 common stocks are used. Each month the volatilities of these stocks are computed and then averaged. This "average" is then averaged for the past 100 months, thus giving a reasonably accurate "normal average volatility." This "normal volatility" is a moving average. The current average volatility is then divided by this "normal volatility" giving a percentage either greater or less than normal. When this percentage is greater than normal, it indicates a primarily speculative market. When this percentage is less than normal, it indicates a primarily investment market. It also indicates the percentage by which it is either speculative or investment.

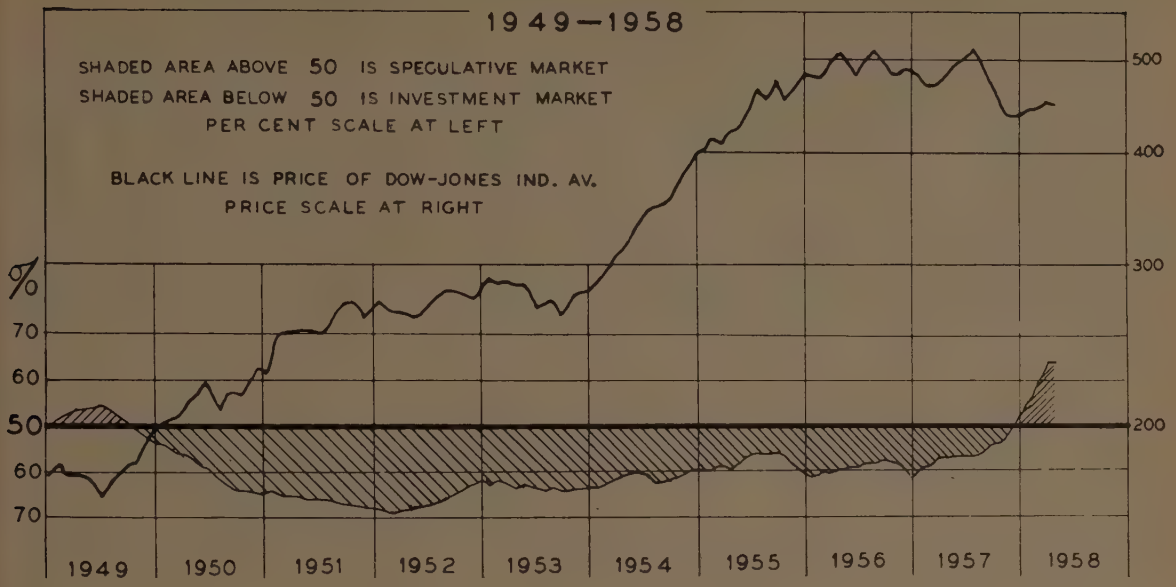
The accompanying chart covering the past nine years illustrates the changes in speculative and investment interest in the market as a whole. In this chart the plotted monthly price of the Dow-Jones Industrial Average is the average of the daily closing prices for the month.

Beginning in July, 1949, we had a declining speculative interest and an increasing investment interest. This was accompanied by a rising price. According to Rule 2, this action indicated investment accumulation—strong buying. The market increased in investment interest to early 1952, when it reached 69% investment. It continued strongly investment into 1957. It was this long investment market with its strong technical foundation which made possible the spectacular market advance from late 1949 to 1957.

Early in 1957 the investment interest declined sharply while speculative interest increased. first with a rising price indicating speculative buying, and later with a declining price indicating investment distribution. From December, 1957, and on we have been in a primarily speculative market which, with its rising price, indicates speculative buying. This means a large potential profit taking overhangs the market. The speculative interest in the market is now dominant. As of April, 1958, we were 64% in a speculative market and 36% in an investment market.

VOLATILITY AND STOP-LOSS PROTECTION

There are other ways in which "Volatility" is a guide. One such is in the placing of stop-loss protection. There are times in an uncertain stock market when it seems ad-



visable to protect profits by stop-loss sales. Often the question is, where should the sale price be placed? It is obvious that a stock with a high volatility should be allowed a larger percentage decline before a "sale" operates than should a stock of low volatility. A stock with a volatility of 175 or over should have its "sale" price 15% to 20% under recent highs, according to its volatility. With a volatility of 125 to 175 "sale" should be placed 10% to 15% under recent highs, while with a volatility of 50 to 125 "sale" should be from 5% to 10% under recent highs.

The above paragraphs have given some insight into the meaning and use of volatilities in the analysis of stocks, stock groups, and of the market as a whole. The "Science of Volatility" is a tool, and a very versatile tool at that. It often indicates what is happening under the surface which is not always discernible on the surface.

General Mills celebrates its 30th anniversary with report of success

sales: $529,820,000
earnings: $5.94 per share

At the close of its third decade, General Mills, Inc., is happy to report to its share owners and employees that 1957-58 was the most successful year in the company's history.

Long-time research investments were rewarded with new products in foods, feeds, chemicals, vegetable oils, and electro-mechanical activities. Reorganized marketing programs strengthened consumer demand for General Mills products. Most important of all, the outstanding efforts of the people of General Mills provided the drive so essential to the year's achievements.

The year was marked by another innovation: publication of General Mills' annual report as a 20-page illustrated supplement in Sunday newspapers in six major cities. If you wish to receive a copy, write to Public Relations Dept., General Mills, Inc., 9200 Wayzata Blvd., Minneapolis 26, Minn.

General Mills

Harry A. Bullis
Chairman

C. H. Bell
President

The Year In Brief

	1958	1957
Received from the sale of products and services	$529,820,115	$527,701,677
Goods and services purchased from others, and amounts set aside for depreciation	415,841,463	422,178,959
Wages, salaries, and retirement benefits	78,140,404	74,670,699
Taxes	21,144,651	18,616,908
Net Earnings	14,693,597	12,235,111
Dividends paid	7,956,207	7,948,259
Earnings in excess of dividends	6,737,390	4,286,852
Net earnings—per dollar of sales	2.8¢	2.3¢
Net earnings—per share of common stock	$5.94	$4.88
Taxes per share of common stock	9.25	8.16
Land, buildings, and equipment	95,573,735	85,531,908
Working capital	78,898,053	71,255,023
Stockholders' equity	143,055,469	136,100,981

Fiscal years ended May 31.

The Divisions of General Mills

Chemical Division: Fatty nitrogen compounds, polyamide resins, amine adducts, vegetable sterols, and other products.

Feed Division: Formula feeds, feed stores.

Flour Division: Bakers and export flours, durum products, oat products, grain activities.

Grocery Products Division: Package foods, flour for household use, and household specialties.

Institutional Products Division: Baking mixes and other products for hotel, restaurant, and institutional use.

Mechanical Division: Electronic and electro-mechanical equipment and instruments.

Refrigerated Foods Division: Refrigerated ready-to-bake biscuits for household use.

Oilseeds Division: Soybean and safflower products.

Special Commodities Division: Vitamin concentrates, wheat starches and proteins, vegetable gums.

Protex, S. A. (Mexico): Steroid intermediates used in manufacture of pharmaceuticals.

Habib-General, Limited (Karachi, Pakistan): Guar gums. (Sixty per cent owned by General Mills)

Suggested: An Improved Statistical Unit for Comparison in Investment Analysis

FREDERICK AMLING

ONE FUNDAMENTAL QUESTION raised by investment analysts is whether a security is fairly priced at the current market level. An associated question deals with the relative attractiveness of two different common stocks, usually about companies in the same industry. The analyst asks: "Is Royal Dutch-Shell Oil common better situated than Standard Oil of New Jersey at the prevailing price?" or "Is General Motors a better purchase than Ford?" These questions are not only asked by investment analysts but by investors for all companies in all industries.

The problem of answering these above questions rests with the analyst. He must interpret correctly the pertinent facts involved in each situation and show the proper conclusion. The facility with which he does this depends on the analytical tools at his command. In the typical financial report for example, a detailed analysis of the industry is made, figures on production and consumption are given and the long run prospects for the industry are estimated. An analysis of the competitive position of the industry with relationship to the national economy and other industries is also included in the study.

Once the industry as a whole has been examined, attention is next focused on the most promising company within the industry. A thorough and complete analysis is made of this company. The company's competitive position is examined, management is appraised, earnings are observed and adjusted, the capital structure is tested and the working capital position, current ratio, operating ratio, price earnings ratio and a host of other ratios are calculated and examined. Collectively, these data provide evidence of the strengths and weaknesses of the company's financial and economic position.

The studies undertaken by investment analysts are usually excellent in conveying important information to investors. In some reports, however, it is difficult to find where one company is superior to the other companies in the industry because of the statistical unit used for comparison. Most financial and operating ratios are presented on a per share basis except for stock yields and these ratios might mislead the unwary investor without further refinment and analysis. Examples of such ratios are earnings per share, book value per share, working capital per share, funded debt per share and gross and net assets per share. Part A of Table I provides several balance sheet and operating statement items that usually appear on a per share basis.

AN INVESTOR BUYS A DOLLAR'S WORTH

The investor, however, does not buy a share of assets and earnings but a dollar's worth of each of these items. For example, if a company's stock is selling for $25.00 per share and it is earning $2.00 a share, the investor receives $.04 of earnings for every dollar invested in the stock. If the investor knew exactly the amount of assets and liabilities and other items he purchased with each dollar spent for stock he would have a much more precise way of making comparisons of companies in a given industry. He would have a better way in which to make more meaningful investment decisions. It is sometimes difficult for a professional analyst to ascertain if Corporation A's stock at 49½ is a better buy than Company B's stock selling at 35½ without some common denominator of value for comparison. The uninitiated investor may find such a comparison impossible.

Financial data would be more meaningful and comparable if it were presented on the basis of value received per dollar of purchase price rather than just the amount received for each share. Such a method would enhance the techniques used by the investment analyst and make the investor's decision-making function much simpler and more effective. An example of data presented with the emphasis on values received per share dollar is presented in Part B of Table I for two corporations in the oil industry. Recently, the common stock of Company A closed at 52½ and Company B at 42½. Examining the results of Part A of Table I, it appears that Company A is in a superior financial position to Company B on a per share basis. This conclusion pertains only to the limited data and ratios presented in Part A of Table I. The financial superiority of Company A, except for the amount of debt per share, is indicated in the ratio column in Part A.

Part B of the Table takes into consideration the price paid for each share of stock of Company A and Company B. The figures presented show the amount of each balance sheet and operating statement item that the investor receives for each dollar paid for the share of stock. With this new emphasis one still reaches the conclusion that Company A is superior to Company B. However, the conclusion is less emphatic. The per share dollar figures provide a much more conservative basis for comparison.

The sales figures in the Table demonstrate again the difference in comparison when the emphasis is changed to per share dollar figures. On a per share basis, Company A's sales are 68 per cent higher than Company B's. When sales per dollar of purchase price are calculated, Company A enjoys a sales advantage of only 33 per cent. In this case, sales dollars per dollar of purchase price of the stock provides a more conservative estimate of the fundamental position of Company A to Company B. Such a comparison leads to a more conservative and more correct interpretation of the data and could prevent costly mistakes that might have resulted if the per share sales figures alone had been used.

The differences that result when per share dollar figures are used are more apparent when one compares physical units. In a recent issue of *Barron's Financial Weekly*, it was stated that Union Oil of California had proven shale re-

Table I

Balance Sheet and Operating Statement[1]
Figures Per Share and Per Share Dollar[2]
for Two Oil Companies, 1956

Items in Balance Sheet and Operating Statement	PART A Balance Sheet and Operating Statement Figure per Share			PART B Balance Sheet and Operating Statement Figures per Share Dollar (2)		
	Company A	Company B	Ratio A/B	Company A	Company B	Ratio A/B
Current Assets	$28.83	$ 9.26	3.11	$.55	$.22	2.5
Current Liabilities	8.31	4.19	1.98	.16	.10	1.6
Working Capital	20.52	5.07	4.05	.39	.12	3.25
Properties (Net)	51.95	29.58	1.76	.99	.71	1.39
Long Term Debt	24.54	7.08	3.47	.47	.17	2.76
Shareowners Equity	50.78	27.44	1.85	.97	.66	1.47
Sales	50.60	30.08	1.68	.96	.72	1.33
Total Gross Income	52.14	30.23	1.72	.99	.73	1.36
Raw Materials, Purchases, Operating and General Expenses	37.14	23.09	1.61	.59	.55	1.07
Depletion and Depreciation	5.45	3.20	1.70	.10	.03	3.33
Taxes, Interest & Federal Taxes on Income	2.60	1.08	2.41	.05	.03	1.66
Total Costs & Expenses	47.66	27.46	1.74	.91	.66	1.38
Net Earnings	4.42	2.77	1.60	.08	.07	1.14
Dividends	2.40	1.60	1.50	.046	.038	1.21

[1] 1956 Annual Reports.

[2] Dollar amount of each item divided by Current Market price per share.

serves of 740 barrels per share compared to Getty Oil's 194 barrels. The obvious conclusion was that Union's shale reserves were 3.81 times greater than Getty Oil's. When this ratio was converted to barrels of reserves for each dollar paid per share, it was found that Union Oil had slightly more than twice as much oil per share dollar as Getty. Union had 13.2 barrels of shale reserves per share dollar compared to 6.1 for Getty. Union remains in the best position but the margin of superiority was less than the original per share figures leads us to believe. Again a note of conservatism is presented by the emphasis on per share dollar figures.

DOLLAR ASSETS

Emphasis on the dollars of assets, liabilities, and earnings an investor receives for each dollar paid for common stock tends to improve the technique of financial analysis. It is a tedious process and must be undertaken each time there is a significant change in market price. Even so, it is only a small part of the financial analyst's functions and can be used satisfactorily only where corporations are comparable as to functions, products, processes and practices. In addition, analysts must have estimates of future earnings, dividends and values since an emphasis on per share dollar figures does not preclude estimates on the future. It also must be remembered that ratios alone do not allow prediction nor are they a panacea for all analytical problems. However, in conjunction with thought and thoroughness, the ratios of the significant financial and operating items based on each dollar paid for a share of stock would allow greater comparability and market comprehension. They would provide a better answer to the fundamental questions raised by the analyst than the present method of analysis where per share figures alone are presented.

Kinetonics—A New Tool in Aircraft Analysis

JAMES J. QUINN

SIMPLY PUT, THE AIRCRAFT INDUSTRY is in the business of producing delivery systems. This applies both to planes and missiles. Each carries its own "payload."

The delivery system business is probably the oldest in the world. It started with the Egyptians with their Nile galleys (3000 B.C.), has gone successively through the caravan, sailing ship, stagecoach, pony express, railroad and steamship, automobile and truck, to air transport.

Unlike other forms of transport, the air delivery business has so far lacked a universal financial measure of performance (variously described as "growth factor," "usefulness," "complexity") that would apply to all forms of aerodynamic vehicles, whether military or commercial, airframe or missiles. Recent researches have come up with an approach that may answer the need. It is called the "Kinetonic Theory."

This theory holds that the growth (or increasing usefulness) of any one form of air transport is measurable by the number of Pound/Miles provided by the given type of air vehicle from one production model to the next.

By Pound/Miles is meant a measure of capacity arrived at by multiplying the gross weight of the vehicle (expressed in pounds) by its top speed (MPH). An analogous concept is that associated with railroading's basic unit of capacity/efficiency, namely, Ton Miles. The name "Kinetonic" reflects the correlative effects of motion (speed) upon mass (vehicle weight). (Incidentally, this principle underlies Einstein's Special Theory of Relativity.)

KINETONIC FACTOR IN PRODUCTION AIRCRAFT

What is the relationship of the "Kinetonic Theory" to aircrafts? In a private study completed in early 1957, the Theory was put to the test. This study traces the kinetonic factor for four military types of aircraft from the first production model to date.

The motivation for this study was to provide a continuous statistical background in order to test the historicity of the Kinetonic Theory of measuring aircraft complexity. As noted, by complexity is meant the same thing as "growth factor"—or, in laymen's language, "performance." They are used interchangeably here. The present objective is to use this study as a foundation to fashion a basic analytical tool useful in comparing relative competitive positions within the aircraft industry.

To repeat, the Kinetonic Theory postulates that by multiplying gross weight of an airframe by its top speed, a statistical factor, Pound/Miles, is obtained that fairly well sets forth the plane's performance, or growth factor, when compared with other aircraft having similar design-missions. Accordingly, in selecting historical sources, the usual specification-performance data (Range, Rate of Climb, Operating Altitudes, etc.) were ignored and only those on gross weight and top speed utilized.

To insure an objective testing of the final application of the Kinetonic Theory, aircraft with the following design-missions have been examined:

1. Fighters
   —Single Engine
   —Twin Engine
2. Bombers
3. Cargo/Transport/Tanker

Space limitations do not permit of a detailed analysis of each of the above aircraft types. For purposes of this inquiry, it is felt that a review of the Cargo/Transport/Tanker type amply demonstrates the underlying principle of the Kinetonic Theory approach.

USAF (and its predecessors, the U. S. Army Air Force, Air Corps, Air Services, Signal Corps) aircraft only are included—again, because of space limitations.

Before commenting briefly on the "growth" of each aircraft model, it is well to note that the "typing" of planes by missions was something less than an art, at least until the mid-1920's. The Cargo/Transport/Tanker type was essentially an outgrowth of World War II. Before that time cargo needs were small, and except for the endurance flight stunts of the late 1920's, aerial refueling as an integral part of military flying was unheard of.

Arrangement of aircraft generally is shown by model numbers, but since our objective here is to trace the trend in complexity from year to year, each schedule is chronological by production delivery years. The basis of selection of individual models in any one year is that each plane must be a new production article (or equivalent—i.e., a significant enough design modification to warrant another letter designation in the same series).

Therefore—and this is important for the long-range utilization of the study—all new production models in a given year are listed if determinable from the data at hand, even though retrogression instead of progression as measured in Pound/Miles, results.

THE KINETONICS OF THE TRANSPORT/CARGO/TANKER

Unlike other military aircraft, the Transport/Cargo/Tankers generally have a commercial counterpart that may, because of military budgetary limitations, "grow" much faster than the Services' planes. Until World War II, at least, that was the case.

WORLD WAR I THROUGH WORLD WAR II

Possibly the closer affinity of the early military transports to the bombers explains, in part, their sharing about the same experience in arrested growth factor from World War I until the mid-1930's. Like the B-17 in bombers, the Douglas C-33 (DC-2, 1936) began to make up for lost time in transports by trebling the predecessor, C-27A's, Pound/Miles, and ushering in "modern" air transport, a pioneering achievement usually credited to the C-33's plan-

Table 1

KINETONICS

Military Transport/Cargo/Tanker Aircraft

Del'y Year	Model	Builder	Number	GTOW (Lbs.)	× V-MAX (MPH)	= POUND-MILES (000's)
1919	T-1	Martin	1	11,700	106	1,240
1922	T-2	N.-Fokker	2	10,750	95	1,020
1924	XT-3	L.W.F.	1	7,320	98	717
1925	C-1	Douglas	9	6,480	119	771
1927	C-1C	Douglas	17	7,440	121	900
1927	C-2	Atlantic (Fokker)	3	9,720	116	1,130
1928	C-2A	Atlantic (Fokker)	8	10,390	112	1,160
1929	C-3A	Ford-Stout	7	9,980	114	1,140
1929	C-7	Atlantic (Fokker)	(5)	10,570	127	1,340
1930	C-7A	General (Atl. Fokker)	(7)	11,030	139	1,530
1931	C-6A	Sikorsky	10	10,150	120	1,220
1931	C-4A	Ford-Stout	4	13,500	148	2,000
1933	C-26B	Douglas	6	8,590	137	1,180
1933	C-27A	Bellanca	10	9,470	145	1,370
1936	C-33	Douglas (DC-2)	18	18,500	202	3,740
1939	C-39	Douglas (DC2½)	35	18,500	210	3,890
1941	C-47A	Douglas (DC-3)	5884	29,300	220	6,450
1941	C-46	Curtiss	25	50,680	264	13,400
1942	C-75	Boeing (307)	5	42,000	250	10,500
1942	C-54A	Douglas	231	65,800	275	18,100
1945	C-69	Lockheed	19	82,000	329	27,100
1946	C-74	Douglas	14	125,000	300+	37,500
1949	PC-121A	Lockheed (L-749)	9	107,000	350	37,500
1950	C-124A	Douglas	200+	175,000	300+	52,500
1950	C-97A	Boeing	50	170,000	345	59,000
1953	KC-97F, G	Boeing	459+	175,000	345	60,500
1953	C-124C	Douglas	200+	195,000	304	59,300
1954	EC-121C	Lockheed	10	140,000	300+	42,000
1955	C-121C	Lockheed	30+	133,000	335	44,800
1955	EC-121D	Lockheed	40+	140,000	300+	42,000
1955	C-130A	Lockheed	200+	124,000	340	41,600
1956	C-133A	Douglas	**	282,000	335	94,500
1956	KC-135A	Boeing	345+	297,000	600	178,000

"+"—next to figures means entries are minimums.

"( )"—converted from previously produced aircraft.

"GTOW"—Gross Take-off Weight (Maximum).

"V-MAX"—Maximum Speed (average long hop).

"POUND-MILES"—Multiple of GTOW and V-MAX.

**—Minimums being expanded.

form offspring, the C-47 (DC-3, 1941), to date, the best-known American transport.

The Curtiss C-46 doubled the C-47's Pound/Miles but held the complexity lead only one year before the C-54 took it away. In 1945 the post-World War II race got under way in earnest, but only relatively moderate gains were seen in performance as the manufacturers seemed to settle down to a period of "growing" their planforms and periodically re-engining the planes. This applies in varying degree to just about the entire spate of post-World War II transporters—witness the Pound/Miles figures.

POST-WORLD WAR II THROUGH KOREAN WAR

While it is true from 1946 to 1954 somewhat superior transports (e.g., DC-7) were available commercially, but not bought in quantity by the Air Force, the Pound/Mile improvements were negligible. Actually, the first post-war transport with a significantly larger growth factor is Douglas' C-133A, just now getting into production and operation. This turboprop-powered aircraft actually is another example of the builder's subscription to a transport philosophy calling for a specialized heavy duty delivery system. Present speed specifications of the C-133A and C-133B, however, may delimit their life spans in a sonic-to-supersonic age, as has already occurred with their genealogical sire. the C-124.

TODAY'S TRUE TRANSPORT

Today's true transport mutation is the KC-135, the prototype of which, the 707 ("Dash 80"), first flew July 15, 1954, just before the Korean War ended. This first of the swept-wing jet diversified delivery systems (Transport/Cargo/Tanker) effects about a 300% growth factor (Pound/Miles) improvement over immediate predecessors (C-124, KC-97), and a 200% jump-gain over the currently produced C-133A. Its primary mission as a purebred tanker

carries on a tradition of Boeing in the refueling field that, though short on years, has allowed the Air Force to go long on the SAC's plans to conduct, on a high performance basis, missions of unprecedented range.

At the same time, the KC-135 has pioneered in another direction. Its commercial versions (707's, 720) mark the first time a transport design, born solely out of military wedlock, even before its own commercial offspring arrive, has spawned an entire family of blood-brother aircraft. The latter, though only recently off the drawing boards and out of the mock-up hangars of competing manufacturers, appear to leave little doubt as to their common paternity.

FUTURE MILITARY TRANSPORTS

The growth potential in the KC-135 platform appears as promising in its way as the C-33 (DC-2) of 20-25 years ago, which was "stretched" by Douglas through a half dozen, or more, "new models." However, already at hand are jet engines powerful enough to lift this weight through the sonic barrier. Whether the big Transport/Cargo/Tanker or its next-of-kin, the big bomber, such as the B-70, will pierce the sound wall first is conjectural—with the odds favoring the bomber.

As the military (that is, the Air Force) has so far refrained from ordering any of the currently-in-production subsonic jetliners as a pure personnel transport, it is possible that the first supersonic transport will be a military airplane. If so, and in view of the structural and other design problems involved, not to mention the enormous cost per plane, it is doubtful whether the inherent "stretch" in the KC-135 planform offers enough exploitable growth potential in time to preclude the early (by 1963-5) appearance of a completely new supersonic jetliner design, on which the major transport manufacturers are currently working.

KINETONICS OF COMMERCIAL AIRLINERS

Now that the introduction of the jetliner to scheduled operations is only a matter of a few months away, an inquiry into the kinetonics of commercial air transports (i.e., those in production during 1957-8) is in order. Table 2 shows the necessary kinetonic data along with pertinent operating and financial figures to illustrate the Kinetonic Theory's application to present-day commercial aircraft delivery systems. This is a stringent test of the Theory's validity. It is interesting to see how it fares.

Annual capacity of each plane is given in seat miles (8 hours daily utilization, 365-day year). Seating configurations are manufacturers', not the carriers, whose seat plans vary widely for identical aircraft, depending on route structure, flight frequency and competition.

Unit cost of the aircraft includes spares. Again, these figures are manufacturers' as airlines differ both as to taste in decor and spares policy.

Heart of the compilation is the relationship of capital costs to seat mile capacity, and to the "pure" kinetonic measurement, Pound/Miles. The Pound/Miles comparison shown in Column (4) is interesting.

PISTON AIRLINERS

Starting with the piston airliners, at once it can be seen that the forces of competition work inexorably. The DC-6B

Table 2

KINETONICS

Commercial Airliners

	(1)	(2)	(3)	(4)	(5) Annual Capacity	(6)	(7)	(8) Capital Costs	(9)	(10)
	Builder	Maximum Speed	Gross T.O. Weight	Pound Miles	Seat Miles — 8 Hr. Day 1st Class	Coach	1 Plane + Spares	Per Mil Seat Miles 1st Class	Coach	Per Mil Pound/Miles
		(MPH)	(000's Lbs.)	(Millions)			($ Mil)	— Cents —		
Piston										
DC-6B	Douglas	360	107	38.5	41.0	68.0	1.76	3.90	2.50	4.42
DC-7	"	412	126	52.0	56.0	83.4	2.30	4.12	2.78	4.43
DC-7C	"	405	143	58.0	62.0	92.0	3.00	4.83	3.27	5.18
1049G	Lockheed	346	140	48.5	51.0	77.0	2.40	4.72	3.13	4.94
1649A	"	372	156	58.0	58.0	86.0	3.00	5.17	3.48	5.18
Prop-Jet										
Electra	Lockheed	448	113	50.6	63.0	86.0	2.50	3.96	2.91	4.94
Viscount	Vickers	335	61	20.4	33.0	33.0	1.19	3.62	3.62	5.82
Jet										
720	Boeing	610	202	123	140.	176.	4.50	3.23	2.56	3.67
707-120	"	590	248	146	166.	196.	5.50	3.33	2.81	3.75
707-320	"	600	296	178	185.	221.	6.70	3.63	3.03	3.77
880	Convair	615	180	110	115.	148.	4.65	4.04	3.14	4.32
DC-8 Domestic	Douglas	586	265	155	159.	195.	5.65	3.56	2.90	3.64
DC-8 Inter-Continental	"	590	288	170	167.	213.	6.45	3.87	3.03	3.80

Notes:

1. Annual Capacity—Seating configurations multiplied by block speed times 2920 (hours in a 365 day year, 8 hours a day).
2. Capital Costs—Per million seat miles, Col. (7) ÷ Cols. (5) and (6) expressed in cents.
   Capital Costs—Per million Pound Miles, Col. (7) ÷ Col. (10) expressed in cents.
3. Capital Costs—Piston planes' unit cost averaged from initial to latest prices.

has preempted the medium-range field for years with no competition. In the long-range market, the DC-7 offers 7% more Pound/Miles than the directly competing 1049G (Super G). The DC-7C and the 1649A, despite variations in speed and weight, are neck-and-neck, offer identical Pound/Miles while they operate side by side on competitive routes internationally.

However, Douglas sold more than twice as many DC-7's as Lockheed did Super G's and 1649A's. Why? Could the explanation lie in the Pound/Mile differential? (The DC-7C was available a year earlier than the 1649A.) When it is considered that air carriers operate on the narrowest of margins domestically, and internationally at a loss, any superiority in weight saving or speed, no matter how small, can be decisive in the competitive airline world of today.

Further support for the economic relevancy of the Kinetonic Theory may be found in unit plane capital costs and their conversion into seat mile and Pound/Mile ratios (Columns (8), (9), (10)). In every instance the Douglas planes show up more favorably. The airlines' long record of preference for the Douglas piston planes suggests the utility of the kinetonic approach in determining competitive positions. As an arguing point, at least, it becomes persuasive.

PROP JETLINER

Moving to the propjets (with only two entries now that the Britannias were cancelled by Northeast Airlines) it is clear that Lockheed's Electra offers some compelling economics. Comparative capital costs ratios not only favor the plane within the propjet category, they are definitely superior to Lockheed's own piston airliners. The degree of Electra's superiority over the Viscount is indicated by the Pound/Mile cost ratio (Column (10)), some 15% below the Vickers ship. Contrasting Lockheed's piston planes' kinetonics with Electra's appears to indicate Lockheed is giving away a lot of airplane for the money—perhaps, from a capital investment recapture viewpoint, too much.

JETLINERS

It is in the kinetonics of the straight jetliner, however, where the most graphic demonstration of the levelling pressures of competition can be seen. Basic reason for this is for the first time in the history of the industry all air transport builders had the opportunity to sell the same type plane at the same time. And all competitors benefited from Boeing's pioneering.

720 vs. 880

Boeing's 720, though 12% larger (kinetonically speaking) is directly competitive with Convair's 880. Superiority in capital costs is decisive (15% less). However, had Convair been able to sell some more of the 880's (i.e., 100 to 150 vs. 50-odd sold) the unit dollar price (Column (7)) would have been at least 12% cheaper, bringing the capital cost ratios much closer together (within 3%). Too hasty conclusions, therefore, must not be drawn from United Airline's choice of the 720 over the 880. What would appear to be a preference of one airframe over another may actually have been a compromise decision turning on United's powerplant policy.

720 vs. DC-8

Within the jetliner group even tighter and more competitive are the kinetonics of the 707's and the DC-8's. This is understandable. Boeing's prototype, the "Dash 80", had been flying for almost four years (since July, 1954) before the DC-8 had its first flight (May, 1958). The latter had the enormous advantage and benefit of profiting from the "Dash 80's" pioneering in jetliner test techniques, flight procedures, and—let us face it—mistakes.

The competitive models that will be fighting side by side on the flight lines for the public eye and be going to the same destinations are 707-120 vs. DC-8 Domestic, 707-320 vs. DC-8 Intercontinental. A comparison of the capital costs ratios underlines the close cost figuring that took place, resulting in an average kinetonic deviation of less than 3% either way.

The fact that Douglas decided not to make a DC-8 version comparable to the 720 (a structurally lightened and shorter fuselaged brother of the 707), may be due to the DC-8's basic planform not permitting a feasible "two-way stretch." Whether the 707's planform actually has that much "rubber" in it will have to wait until late 1959-early 1960, when the 720 "first flights." A difference in builders' philosophy may also have been involved with Douglas favoring a completely new, much lighter plane that could not be born, as no suitable powerplant could be made available for an early enough marriage.

SIGNIFICANCE

In an industry as complex and mercurial as the aircrafts, the danger in adopting a formula approach to the analysis of its component members is obvious. The shifts in underlying forces, political as well as economic, can occur so fast as to out-race the formula's figures before they can get out of the slide-rule.

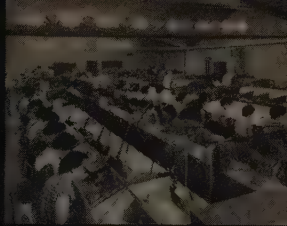
The kinetonic approach, far from being a one-answer formula, has been devised and used with full awareness of its present limitations. Much work remains to be done. It currently has optimum utility when applied to production aircraft. There it does achieve its present limited objective of affording a quick and fairly accurate index of relative competitive positions of production aircraft with similar design-missions.

The Kinetonic Theory, of course, can, as a general thesis, be applied to missiles also. Until, however, more production models are on the line and operational—a matter of two to three years—its specific applicability will for a time at least have to remain more in the realm of theory than reality.

Looking to another aspect of the aircrafts, the Know-How/Why that really makes them tick competitively, recent studies give every promise of an application of the kinetonic approach of even greater importance to the analyst. This has to do with measuring the actual value in dollars-and-cents terms of that indispensable assets of an aircraft company, its design, engineering and administrative talents ("Know-How/Why"), the worth of which appears nowhere on the balance sheet. But that is another, separate, subject to be dealt with another day.

easily expansible cellular construction

hyperbolic paraboloids form roof-ceiling



assembling precision products

V-spacers go up quickly

patio brings outdoors indoors

two V-struts form space frame

well-lit downstairs offices

first building on TI's 300-acre Dallas site

huge new plant for tiny products to
ENRICH YOUR FUTURE—ELECTRONICALLY

News, pictures, music, light, heat, cold and thousands of other services to man are borne by streams of electrons crisscrossing the face of the earth. At an almost explosive rate, yesterday's electronic miracles are becoming today's commonplace; are swelling the demand for miniature components such as the transistors, diodes, rectifiers, resistors, capacitors produced by Texas Instruments.

Hence this newest addition to TI's facilities, a seven-acre building of functional character, a pleasant place in which to work, designed for quick change or sudden growth. Flexibility and expansion ease derive from two shapes used here for the first time industrially in the U. S. Concrete "umbrella-roofed" bays form clear floor areas 63 ft wide and up to 147 yd long. Nine-foot V-spacers between the two floors make the some three dozen utilities completely accessible and available to both floors.

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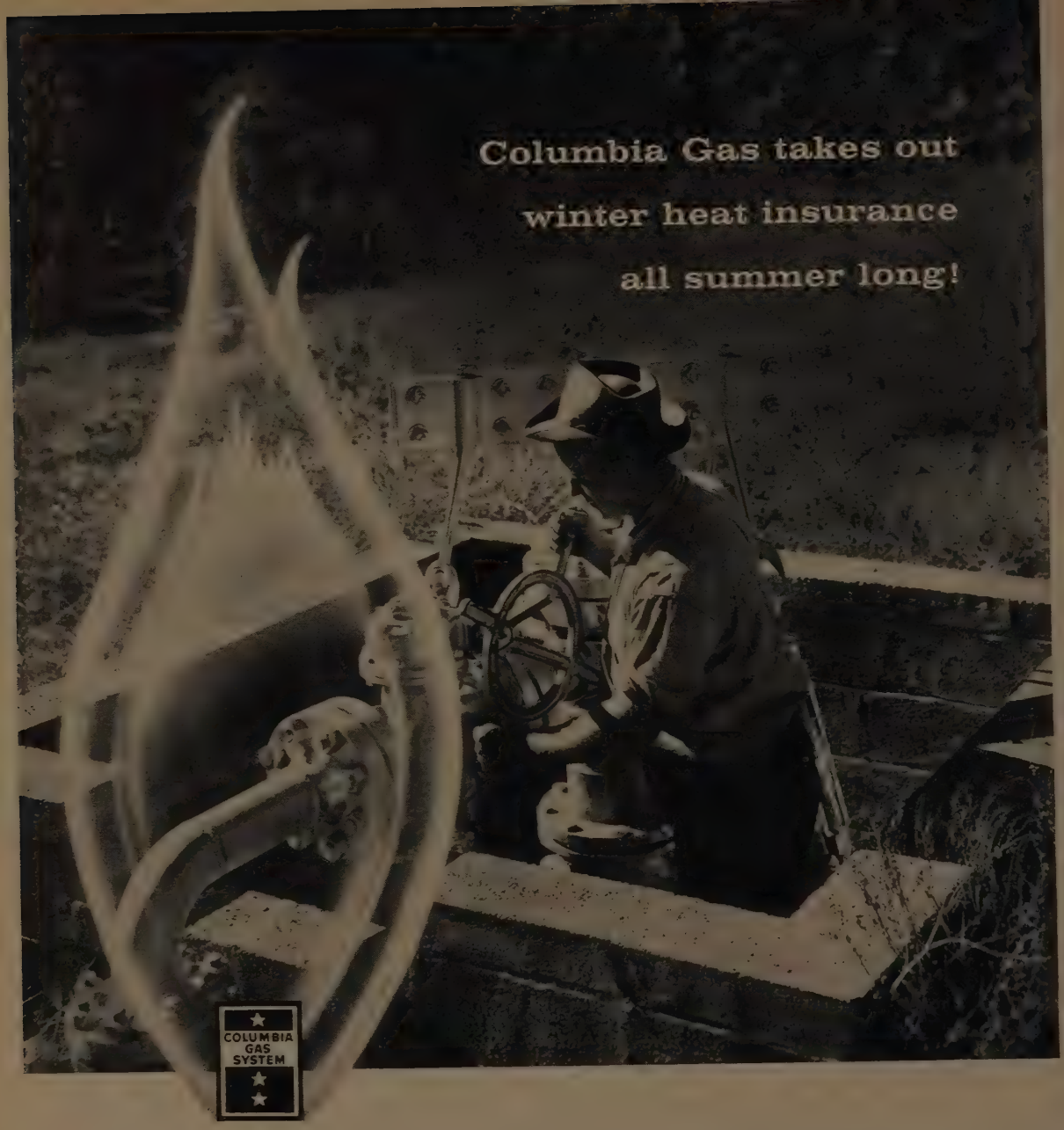

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This gas is stored in the 42 underground storage fields operated by the Columbia Gas System. More reservoirs for gas storage are planned for the future to meet the ever-increasing demands of home and industry.

Underground storage is one way Columbia Gas makes sure it can supply its customers economically and efficiently . . . and one more reason why, more than ever, natural gas is the preferred fuel throughout the area served by the Columbia Gas System.

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The Bright Future for the Gas Industry

MARTIN A. ELLIOTT and MARVIN CHANDLER

FRONTIERS OF SCIENCE gradually evolve into frontiers of technology, which in turn pioneer the technological achievements useful to mankind. Thus today's advanced technology owes its very existence to basic scientific discoveries made far in the past. In retracing the family tree of a particular technological development, we eventually reach a point at which the scientific knowledge accumulated up to that time clearly indicates the possibility of ultimate practical application of the work. At that point we are still at the frontiers of science and may remain there for some time afterward, until enough new knowledge has been created to pioneer the technology.

When one reflects upon the rapid technological advances that have been made in the past two decades, one can approach the problem of making projections with conviction and enthusiasm. In our recent experience, we have seen basic research on atomic nuclei blossom into large-scale production of energy by fission reactions; we have seen the transistor and solar battery emerge from fundamental studies of solid state physics. These are typical of the many technical advances that we ourselves have witnessed, and which have influenced our industrial development and contributed so much to our general welfare and high standard of living. With this record before us, one may be led to believe that almost any reasonable prediction of future progress has an excellent chance of becoming a reality. But we must not let our past experience make us complacent about our future progress, because we will not maintain the same rate of progress and degree of success unless we support and expand our basic research. Basic research has in the post-Sputnik era become a popular cause, but for many years prior to this scientists have repeatedly emphasized the need for more basic research. Even in research, the law of diminishing returns applies, and we must recognize that the greater our technological progress the more difficult it becomes to discover new principles and to create new knowledge. Thus, basic research must expand with technological progress. Accordingly, when we explore today's frontiers of science and their applicability to the future progress of the gas industry, we are at the same time directing management's attention to those areas of fundamental research that are important in the industry's long-range planning, and therefore should be fostered and supported.

PRIMARY ENERGY CONSUMPTION AND AVAILABILITY

Any discussion of the future of the gas industry is inextricably linked with the over-all energy problem. Studies of this problem have clearly indicated that the future demand for energy is likely to be enormous if our sociological and economic progress is to continue as in the past. The question is not one of demand for energy, but rather how to advance our knowledge and technology so that we can satisfy this demand in the long-range future. Thus the gas industry along with other energy producing industries has a bright future insofar as the demand for its product is concerned.

The pattern of energy utilization in the past and projected for the future clearly shows the prominent role played by the fluid fuels—oil and gas. Several such patterns have been published. The one chosen for illustration (see Fig. 1) presents an objective view insofar as the gas industry is concerned, because it was prepared by Dr. Lawrence R. Hafstad, whose background is in nuclear physics. Fig. 1 unmistakably reflects the consumer's awareness of the significant advantages of the fluid fuels and of the value of energy in this form. These fuels can be distributed and stored at a minimum cost. Gas has the added advantages of cleanliness and of not requiring storage on the consumer's premises. Fig. 1 shows no let-up in the demand for energy in the form of fluid fuels, which in the year 2000 may account for 75% of the energy consumed in the United States.

The pattern of consumption of primary energy shown in Fig. 1 should not be construed as a time table, but rather should be regarded as a qualitative indication of trends. Thus we see that at some time in the future the greater portion of our fluid fuels must be derived from the solid fossil fuels. Therefore, in looking toward the future, we must consider not only the potentialities of gas production processes, but also the supply of fossil fuels.

Recent estimates of the total future reserves of fossil fuels in units of Q are shown in column one of Table 1. The unit Q is 10^{18} Btu, or 10 trillion therms of natural gas. It may be visualized as a sphere of natural gas 24 miles in diameter. The estimates in column 1 are based on physical quantities in place and no cognizance has been taken of the effect of economic factors on the actual production or recovery of these reserves. In the case of coal, the economic effect can be approximated by considering only those reserves existing in seams thicker than 28 inches, and at

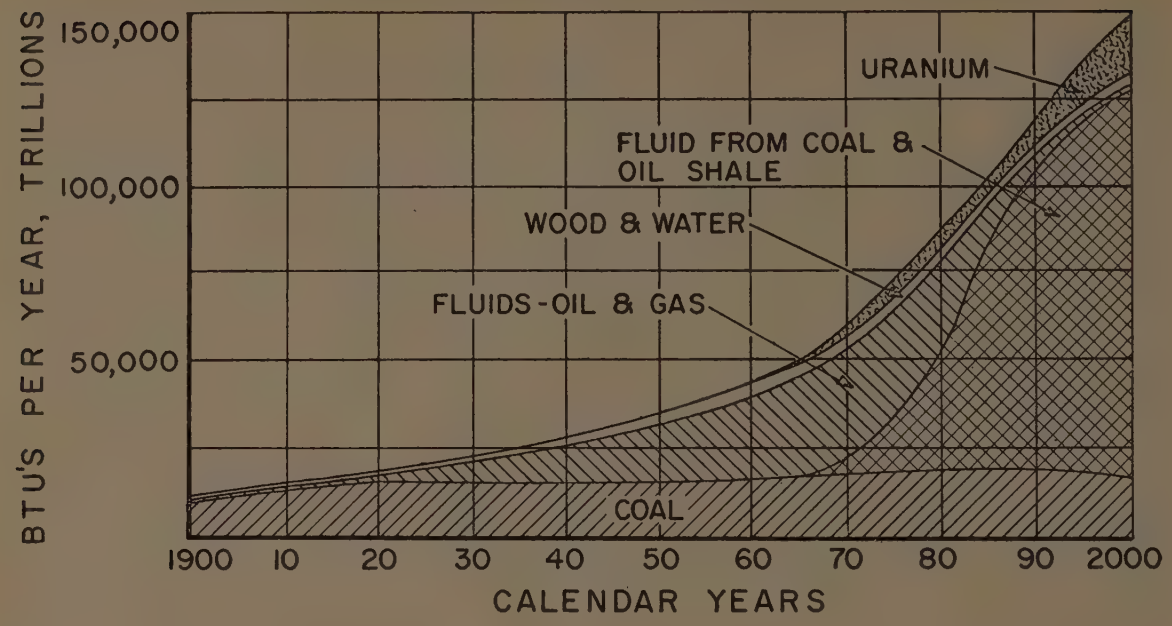
Table 1. Future Fossil Fuel Reserves

	Total	Recoverable as Primary Fuel	Recoverable as Fluid Fuel	Cumulative U. S. Energy Demand 1958-2000
Coal	20.5 Q*	5.1 Q**	3.0 Q	
Crude Petroleum	1.1 Q	0.5 Q	0.5 Q	
Natural Gas and natural gas liquids	1.3 Q	0.6 Q	0.6 Q	
Oil Shale				
Colorado	7.2 Q	4.9 Q	4.9 Q	
All other states	11.8 Q			
Total	41.9 Q	11.1 Q	9.0 Q	3.6 Q

*Q = 10^{18} Btu = 10 trillion therms of natural gas (a sphere of natural gas 24 miles in diameter).

**An additional 6.2 Q could be recovered at 1.25 to 1.50 times present prices.

Fig. 1.—CONSUMPTION OF PRIMARY ENERGY IN THE UNITED STATES, 1900-2000



depths less than 2,000 feet, which could be recovered at or near present prices. Column two of Table 1 shows that about 25% of the coal reserves meet this requirement. In the case of crude petroleum it may be inferred from a recent comprehensive study that with average drilling return and a maximum price of $4 per barrel, we might expect to recover about 45% of the estimated ultimate reserves of crude petroleum. If we assume a comparable figure for natural gas, and if we consider only the high quality Colorado shales with 75% recovery in mining and 90% recovery in processing, then we will produce usable energy equivalent to 11.1 Q at or near present prices. If we assume further that all our fossil fuels are converted to fluid fuels, then the energy available from our reserves is equivalent to 9.0 Q. This value may be compared with the estimated United States energy requirement of 3.6 Q between the present and the year 2000. Thus even if all of our energy requirements for the rest of this century are assumed to come from fluid fuels, we will still have 60% of our economically recoverable reserves of fossil fuels left in the year 2000. This could increase to slightly more than 70% if we include coal recoverable at 1.5 times present prices.

It must not be inferred from the foregoing discussion that we can be complacent about our fossil fuel reserves. However, the indications just presented are much more favorable than earlier projections, principally because of the enormous increase (twelvefold) in the estimates of energy recoverable from oil shale. Thus in the immediate future, by which is meant the next half century or more, our fossil fuels could supply all of our energy requirements in the form of fluid fuels. In the long-range future, we must look to other sources for fluid fuels, but before this our long-range planning should consider all possible methods for extending the life of our solid fossil fuels and for making the maximum quantity available for conversion to fluid fuels.

A fitting closure for our discussion of fossil fuel reserves is an analogy drawn by Eugene Ayres, who has graphically portrayed the fossil fuel picture by personifying the earth today as a young man who has just become 21 years old. It was not until his sixteenth birthday that this young man began to store up large quantities of energy in the form of fossil fuels. This process continued for about five years. At the age of 21, the young man began to use up the energy stored in the preceding five years with the help of a creature known as homo sapiens and also with the help of this creature's robot servant known as the machine age. The young man's helpers are so industrious that all of the accumulated fossil fuel energy will be used up in five minutes. We are living somewhere in the middle of this five-minute period.

We have seen that the consumer of the future will want gas, and that at some time in the future gas will be made from solid fossil fuels and eventually from other energy sources. This then brings us to the point of examining today's frontiers of science and technology in relation to methods and processes for insuring the long-range supply of energy in the form of gaseous fuel.

LIQUEFIED NATURAL GAS

Our previous discussion of energy availability was concerned only with sources of energy within the continental United States, and no allowance has been made for Canadian or Mexican gas imports, which are certain to be significant. If we broaden our outlook it becomes immediately apparent that vast quantities of natural gas are pro-

duced in the Middle East and in Venezuela, where no local market exists for this gas. This fact along with the high fuel costs and energy shortage in Western Europe has given considerable impetus to developments in tanker transportation of liquefied natural gas. The first trial tanker to carry about 90 MMCF of liquefied gas is under construction, and soon deliveries will be made to the North Thames Gas Board in London. Here our industry is witnessing the early stages of a new technology which holds great promise for augmenting our domestic supplies of natural gas and for conserving our solid fossil fuels by postponing the time when it will become necessary to gasify them.

GASIFICATION OF OIL SHALE

Oil shale is the unsung hero of our fossil fuel reserves. Until comparatively recently, little attention was paid to this important resource. Table 1 shows that our supplies of oil shale from the Green River formation alone would yield 65% more fluid fuel than our economically recoverable reserves of coal. For some years past, oil shale has been considered only as a future source of petroleum products, and methods for extracting crude shale oil have been developed by the Bureau of Mines and by the Union Oil Company. Because of the interest of these and other groups, our deposits of oil shale have been carefully investigated, and it is almost certain that our reserves in the Green River formation are known with greater accuracy than in the case of any of the other fossil fuels. Such vast and well-defined reserves should certainly be considered as a source of high-Btu gas in the future.

With this in mind, the Institute of Gas Technology has recently begun a basic study of the production of high-Btu gas directly from oil shale as mined without first retorting the shale to produce shale oil. Even though this work is in the early basic research stage, it has already been shown that oil shale can be hydrogenated directly at moderate pressures to give a net yield of 2500 CF of high-Btu gas per ton of shale, which alternatively could produce 23 gallons of shale oil. This demonstration of feasibility clearly indicates that the gas industry can tap our enormous reserves of oil shale as a potential source of high-Btu gas in the future.

HIGH-BTU GAS FROM COAL

Two processes can be used to produce high-Btu gas from coal. The first of these is referred to as the methanation process. In this process coal is gasified to produce synthesis gas, which is then purified and converted to methane or high-Btu gas in the presence of a catalyst. This process is in an advanced stage of development, and, considering technology alone, it could be operated today if necessary.

The second process for converting coal into high-Btu gas involves the reaction of coal directly with hydrogen at moderate pressures and elevated temperatures. The feasibility of this process was first demonstrated in small scale experiments similar to those mentioned in discussing the potentiality of oil shale. Recently a small continuous pilot plant has been operated at the Institute of Gas Technology. This plant has confirmed the results of the basic research experiments, and in addition has demonstrated the operability of the process under conditions simulating those encountered on a larger scale. Although we are still at the frontiers of technology, the results obtained thus far point to the eventual successful technical development of this process, and thus to its availability to the gas industry as another method for producing high-Btu gas from coal.

Significant modifications of both of the foregoing processes will soon be investigated in the United Kingdom and in this country. There are excellent reasons for believing that these developments will culminate in more efficient, more versatile, and less costly processes for the conversion of coal into high-Btu gas. We can only conclude from the foregoing that when the time comes the gas industry will have available to it several methods for producing high-Btu gas from coal at prices that will permit maintenance of its competitive position.

NUCLEAR ENERGY

The vast storehouse of energy made available to us through nuclear reactions awaits only our ingenuity before all of its potentialities can be translated into direct benefits to our energy system. United States reserves of nuclear fuel have been estimated at 1500 Q, which is about 400 times the United States energy requirement for the next 40 years. Developments in the utilization of nuclear energy are in their infancy, but already it is apparent that many of these developments can be effectively applied to gas production processes and gas industry operations. Since both radiation and heat can conceivably be used in these applications, the gas industry offers a significant peacetime potential for nuclear energy.

The most obvious application of nuclear energy to the production of gaseous fuels is its utilization for process heat. Many gasification reactions absorb energy, which with present technology must be supplied by fossil fuels burned with oxygen. If nuclear fuels supplied the energy requirements of gasification processes, our reserves of solid fossil fuels would be extended and conserved for conversion into fluid fuels. This could have a significant effect on the life of our coal reserves. Both the Bureau of Mines and the Atomic Energy Commission are cooperating in the development of gasification processes using nuclear energy. Many problems involving materials of construction, control of radiation and release of energy at gasification temperatures must be solved. However, the solution of such problems is also important to the economical generation of electricity from nuclear fuels. Technological advances in this latter field will also be applicable to the use of nuclear energy in process heating and gasification reactions.

The application of nuclear radiation to chemical processing is a field that is developing rapidly, but in the case of gasification reactions the surface has been barely scratched. Studies made at the Armour Research Foundation have shown that coal may be broken down (depolymerized) into simpler chemical compounds by gamma radiation. Such treatment will doubtless yield a more reactive material for subsequent conversion to high-Btu gas. Other applications of radiation chemistry to gas production processes include acceleration of gaseous reactions and innumerable possibilities in activating and developing inexpensive catalysts with specific properties.

SOLAR ENERGY

Solar energy occupies a unique role in all energy studies because it is our major source of income energy. Effective and economic utilization of large quantities of solar energy in photochemical reactions of interest to the gas industry depends on continued progress and support of basic research on photochemistry and biochemistry. We are truly on the frontiers of science in the photochemical utilization of solar energy and the fixation of carbon from the atmosphere. However, many methods under consideration would be ideally suited to gas industry operations. For example, the photochemical decomposition of water into hydrogen and oxygen in the presence of ceric and cerous ions has extremely interesting possibilities if the overall efficiency could be improved. This and similar developments, although they may be far in the future, are important to the gas industry because they promise a source of fuel that is dependent only on solar energy and water. Thus gas supply would be assured even in a non-fossil fuel era. Furthermore, it seems most likely that the gas industry's efficient and economical transmission and distribution system will continue to be used at that point down the road when gas from fossil fuels is no longer abundant.

Before leaving solar energy, attention must be directed to the problem of storage of energy derived from the sun. In a recent article, Reid makes the following statement, "The importance of energy storage cannot be overemphasized. Although a few applications can be foreseen where solar-produced energy would be consumed as it was produced, in the long run some scheme of economical storage overnight and during bad weather is certain to be necessary." We in the gas industry know that storage of gas derived from solar energy offers a proven economical method for solving the storage problem, and at the same time puts the energy in a form that can be transported and distributed more economically than electricity. In fact, the cost of distributing gas is less than one-fifth of that for distributing an equivalent quantity of electrical energy. We can but conclude from the foregoing that gas is destined to play an important role in any future large scale indirect utilization of solar energy.

DEVELOPMENTS IN THE UTILIZATION OF GASEOUS FUELS

The field of gas utilization is so extensive today that it embraces many diverse technologies in the chemical, metallurgical and manufacturing industries. Furthermore, in domestic and commercial utilization, the end use of gas includes comfort and water heating, cooking, refrigeration, air conditioning, clothes drying and incineration. Adequate coverage of the future potentialities of current scientific and technological developments in such a broad field cannot be attempted in this discussion. Instead we will focus attention as examples on only two of these developments which could have far-reaching effects on our energy system.

FUEL CELLS

The fuel cell is the ideal ultimate means for converting the chemical energy of fuels into electrical energy. The fuel cell is analogous to a storage battery. In the storage battery the energy from a chemical reaction is converted into electrical energy at ordinary temperatures. Similarly, in the fuel cell the energy released when gas reacts with air is also converted directly into electrical energy at moderate temperatures. The fuel cell provides a means for accomplishing this conversion and for making possible the combustion reaction at relatively low temperatures. Because of its low operating temperature and direct conversion of chemical energy into electrical energy, the fuel cell has an overall efficiency more than twice as great as the conventional steam power plant. Thus the development and commercial application of the fuel cell would have a major effect in extending the life of our fossil fuel reserves.

The history of the fuel cell extends back more than 100 years, but it was only comparatively recently that fuel cells operating on hydrogen were developed. Here we see the connection between the fuel cell and the gas industry. In fact, it has been stated that the use of fuel gases offers the greatest promise for the commercial development of the fuel cell, because solid fuels create operating problems and inherently give lower efficiencies. It is apparent, therefore, that gaseous fuels are an essential ingredient for the successful development of fuel cells. The potential application of the fuel cell when it is fully developed would complement the already diverse applications of energy in the form of gaseous fuels. Thus the fuel cell could be a major factor not only in our overall energy system, but also in the future utilization of gas.

DIRECT REDUCTION OF ORES

The direct reduction of iron ore with hydrogen or carbon monoxide is a development that is currently under intensive study. Here again is a new technology based on gaseous fuel that would obviate the need for large quantities of coking coal. The source of gas for reduction may be either natural gas, oil or coal. Thus off-peak gas could be used when available and the alternate fuels used during the gas industry's peak periods. In any case, economic incentives will stimulate the technology of gas production processes by all industries involved, and the gas industry is thus assured of direct benefits when its product is used, and of indirect benefits resulting from advances made in gasification technology.

SUMMARY

In the foregoing discussion, an attempt has been made to examine the implications of today's scientific and technological developments as they relate to future operations of the gas industry. This examination has shown that the inherent advantages of energy in the form of gaseous fuel, namely, minimum transportation cost, storability, flexibility and cleanliness, are essential factors in many future energy conversion and utilization processes.

Consideration of supplies of gas in the future discloses many sources available to the industry when the need arises. World reserves of natural gas can be tapped through tanker transportation from producing areas where no local gas market exists. Our solid fossil fuels, coal and oil shale, can be converted to high-Btu gas and will last for many years to come. Nuclear energy is applicable to gasification processes and if so applied would extend the life of our fossil

fuel reserves. Even if we extend our outlook to the era when income solar energy will be used, we see that conversion of solar energy into gas which can be stored and transported would solve one of the major problems in the indirect use of energy from the sun.

In the field of energy utilization, the fuel cell offers great promise. Since its commercial development will be based on the use of gaseous fuel, it could represent an important and versatile consumer.

We can conclude that today's scientific and technological developments foretell an extremely bright future for the gas industry. Lest we become overconfident about this rosy outlook, a word of caution should be injected. As mentioned at the beginning of our discussion, these projections may not come to fruition, or may come to fruition too late unless both basic and applied research is actively supported. We cannot pay lip service to these activities. They must be supported with real conviction, understanding and enthusiasm. We all know that our industry has for many years been active through the PAR program in supporting both basic and applied research in many of the fields mentioned. However, let us recognize that research needs to grow as the industry grows, and let us as a part of our management responsibilities, see to it that our industry's support of research is adequate to insure the bright future indicated by today's science and technology.

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The Investment Standing of the Steels

WALTER S. McCONNELL

THE INVESTMENT STANDING of a common stock is determined by the risks of the enterprise and the potentials for growth—and the appraisal by investors of the risks and potentials normally is reflected in the price of the issue relative to its earnings and dividends. Judged by price-earnings measurements, the investment standing of the steel stocks is still relatively low despite some improvement in recent years. At its December 31, 1957, closing price, United States Steel sold at only 7 times 1957 earnings of $7.33 a share. By comparison, the closing price of the Dow Jones Industrial Average was 12 times 1957 earnings. Alcoa and General Electric, two quality growth issues, were priced at 17 and 22 times earnings. While price-earnings ratios have changed in 1958, the relationship between U. S. Steel and the others has not been altered significantly. U. S. Steel's relatively low price-earnings ratio indicates that investors are placing primary emphasis on the risks associated with the steel business and according only minor weight to the potentials for growth.

CYCLICAL RISKS

The risks in the steel business are principally of a cyclical nature. Risks of inventory losses, product displacement and plant and equipment obsolescence probably are smaller than in most other industries. Steel, however, is a durable product with markets concentrated importantly in capital goods fields, and consumption often fluctuates over a wide range. Because of shifts in customer inventory policies, steel production is subject to even greater fluctuations than steel consumption.

The cyclical nature of steel demand has been clearly demonstrated during the current business recession. Production in the first quarter of 1958 was off 41% from the year-earlier period. Production as a per cent of capacity declined by a greater amount because of an increase in rated annual capacity to 140.7 million tons from 133.5 million tons in 1957. The industry operating rate averaged 54% of capacity in the first quarter, against an average of 96% in the first quarter of 1957 and 84.5% for all of last year. Operations fell to 48% of capacity in April but improved in May and June and for the second quarter were about in line with the first quarter average of 54%.

Approximately half of the decline in production has been due to reduced consumption of steel accompanying the contraction in general economic activity, with the remaining half caused by liquidation of customer inventories. The Federal Reserve Board Index of Industrial Production in the first quarter was off an average of 11% from the like 1957 quarter, and consumption of steel—the basic industrial metal—generally correlates closely with the FRB Index, as shown in the table below. Steel production for the years 1952-1957 is adjusted in the table for estimated changes in customer inventories to arrive at an approximation of steel consumption. Apparent consumption is then divided by the FRB Index to show the tonnage of steel consumed for each point of the FRB. This computation indicates that consumption of steel over the past six years averaged 792,000 tons per point of the FRB Index, ranging from a high of 805,000 tons per point in 1953 and 1955 to a low of 766,000 tons in 1956.

Steel Ingots—Millions of Tons

	FRB Index	Production	Est. Change in Inventories	Est. Consumption	Est. Consumption per FRB Point
Avge. 1952-57	135	106.3	— .4	106.7	.792
1957	143	112.7	— 2.1	114.8	.803
1956	143	115.2	+ 5.6	109.6	.766
1955	139	117.0	+ 5.1	111.9	.805
1954	125	88.3	—10.1	98.4	.787
1953	134	111.6	+ 3.8	107.8	.805
1952	124	93.2	— 4.4	97.6	.787

The current annual rate of steel consumption is estimated at around 95 million tons, or 65% to 70% of industry capacity. The estimate of current consumption is based on steel usage of 750,000 tons per point of the FRB Index (now around 127). It seems probable that the present ratio of steel consumption to the FRB is a little below the lower end of the range of experience in recent years inasmuch as the decline in industrial activity has been particularly severe in some large steel consuming segments of the economy. Automobile output, for example, is down more than 30% this year, and activity in the automobile industry is much more important to steel than to the FRB Index.

With steel consumption estimated at an annual rate of around 95 million ingot tons (65% to 70% of capacity) and production at a rate of only about 76 million tons (54% of capacity), inventories apparently are being reduced at a 19 million ton annual rate, or more than 1.5 million ingot tons a month. The current inventory liquidation contrasts with the experience during the first half of 1957, when inventories were being expanded to peak levels in anticipation of a price increase at mid year.

Steel earnings, meanwhile, have dropped more steeply than production, but profits of the leading companies nevertheless have been relatively well maintained considering the severity of the decline in volume. In the table below the combined sales, earnings and shipment figures for seven leading steel producers (accounting for over 70% of total industry capacity) are tabulated for the 1958 first quarter and compared with results in the like quarter of 1957. Aggregate shipments of finished steel products were down 39%. Sales fell by a smaller amount as a consequence of the $6 a ton steel price increase in mid-1957 and a shift in the product mix toward higher priced steels. Net income was off 53% but unit profits did not decline drastically. Three of the seven companies (Armco, Inland and U. S Steel) earned their dividends but the remaining four

(Bethlehem, Jones & Laughlin, Republic and Youngstown) did not. Dividends so far have been maintained by all seven companies. National Steel—the fifth largest producer—is not included in the comparison because the company does not report shipment figures. National's first quarter earnings were down 72% and the quarterly dividend was reduced from $1 to 75 cents.

	First Quarter 1958	1957	% Change
Steel Shipments (000 tons)	10,105	16,545	—39%
Sales (mill.)	$2,039.9	$2,993.0	—32%
Net Income (mill.)	$ 118.2	$ 250.0	—53%
Per Ton			
Sales	$201.90	$180.90	+12%
Net Income	$ 11.70	$ 15.10	—23%

Steel managements generally have done an excellent job of controlling costs. Production has been concentrated in the most efficient facilities. Salaries and other costs normally considered fixed have been cut to reduce the heavy overhead burden characteristic of the steel industry. Maintenance and repair expenditures have been curtailed in line with the fall in production. Earnings also have benefited from a drop in scrap prices and reduced charges for accelerated amortization. One company—U. S. Steel—has suspended pension fund contributions, which previously had been made at well above the minimum rate required for actuarial soundness.

Break-even points in the industry apparently have been reduced substantially. Although no figures are available, break-even points in the early postwar period probably were on the order of 60% to 70% of capacity. Heavy investment in new plant and equipment, improvements in management efficiency, and advances in steel prices, however, have greatly increased the profitability of the industry and reduced the leverage in steel operations. Break-even points of the strongest producers probably are now around 40% of capacity or perhaps moderately lower. Republic Steel, for example, earned $8.6 million in the first quarter, with operations at 43% of capacity and shipments at a rate of 41%. The break-even point for this company probably is only around 35% of capacity under current conditions.

A major factor in the relatively favorable earnings performance and the low break-even points has been the maintenance of a sound price structure for steel. Premium prices —including regional premiums in Detroit and St. Louis— have been reduced or eliminated, some extra charges have been lowered and most companies are absorbing freight in order to compete in distant markets. The basic mill price for steel, however, has remained firm and this has prevented a much more serious decline in earnings.

The strength in prices has been due in large part to vigorous pricing policies followed by U. S. Steel. In contrast to its position in the 1930's, U. S. Steel is now the strongest—and apparently the lowest cost—producer in the industry. The company has made it clear that its prices will be competitive on all products and in all markets and this has discouraged potential price cutters. Steel managements generally are convinced, moreover, that demand for steel is relatively inelastic. On most products a price cut would not materially alter the competitive relationship with other materials and would not stimulate end-use consumption importantly. One steel official recently pointed out that a steel price cut of $10 a ton would reduce the cost of an automobile by only $20. A price cut of this magnitude, on the other hand, would reduce steel profits by almost 50%.

A CRITICAL INVESTMENT PERIOD

The current business recession appears to represent a critical investment period for the steel industry. In the event of a further substantial decline in business activity and steel consumption, pressure for price cuts would intensify and might be sufficient to break the steel price structure. Earnings then would be likely to fall steeply and dividend cuts probably would be widespread. Such a series of events would tend to reinforce the current emphasis by investors on the risk aspects of the steel industry.

If, on the other hand, business activity holds close to current levels or turns upward in the second half of the year, the investment standing of the steel stocks could be enhanced importantly as a consequence of the industry's performance during the current business recession. The performance so far has been favorable. Cost controls have worked effectively and selling prices have been maintained. Break-even points are lower than previously estimated and appear to compare favorably with those in most other industries despite the heavy overhead burden in steel.

Provided over-all economic activity does not fall by a substantial further amount, the industry seems likely to continue to weather the recession in strong fashion. As noted above, approximately half of the decline in steel operations has been caused by liquidation of customers' inventories of steel. Inventories apparently have been reduced significantly and the correction may be completed within the next several months. Merely a leveling out of economic activity and steel consumption, therefore, could be expected to result in an increase in steel production later in the year. A rise in volume would remove most of the pressure for a cut in steel prices and prices probably would be raised to compensate for the advance in wage costs on July 1. Earnings would increase and doubts concerning the maintenance of dividends would be largely eliminated. A clear demonstration that the industry can hold selling prices and maintain dividends throughout a relatively severe recession period could be expected to result in an improved investment rating for steel stocks generally.

POTENTIALS FOR GROWTH

The proper classification of steel as a growth or nongrowth industry is subject to considerable misunderstanding. From the standpoint of physical volume, steel does not qualify as a growth industry. Because of the broad diversification of markets (construction, automobile, machinery, container, appliance, railroad, oil and gas, and others) and the depth of market penetration, consumption of steel cannot be expected to gain at a faster rate than the economy as a whole. Over a long period of time, in fact, steel has lost ground relative to the FRB Index because of the ten-

dency toward fabrication of metals to higher stages, and it seems probable that this trend will continue.

From the standpoint of earnings growth, on the other hand, the postwar record of the steel industry is well above average. In the table below, the postwar earnings of U. S. Steel—the largest steel company—are compared with those of the Dow Jones Industrials, Alcoa, and General Electric. U. S. Steel's performance ranks as the best by a clear margin. The company's earnings per share in 1957 were 3.3 times average earnings in 1947-1949, in contrast to ratios of 1.7 for the Dow Jones Industrials, 2.5 for Alcoa and 2.1 for General Electric.

	Earnings Per Share			
	U. S. Steel	Dow Jones Industrials	Alcoa	General Electric
1957	$7.33	$36.08	$3.55	$2.84
1956	6.01	33.34	4.24	2.45
1955	6.45	35.78	4.18	2.40
1954	3.23	28.18	2.95	2.30
1953	3.77	27.23	2.85	1.92
1952	2.27	24.78	2.29	1.75
1951	3.05	26.59	1.91	1.60
1950	3.65	30.70	2.27	2.00
1949	2.70	23.54	.95	1.45
1948	2.00	23.07	1.95	1.43
1947	1.95	18.80	1.30	1.10

The superior earnings growth of U. S. Steel has been based on a steep rise in unit profits. Shipments of finished steel products in 1957 were only 19% above average shipments in the 1947-1949 period. Profits per ton of shipments, however, were more than twice the 1947-1949 average, or $17.90 (before preferred dividends), against $7.15 in 1947-1949.

The wide gain in profits per ton has been caused primarily by higher selling prices. Steel prices have been raised in every postwar year and prices in 1957 as measured by the BLS Index were 78% above the average level in the 1947-1949 base years. Productivity per man hour also increased by 30% in this period as a consequence of heavy expenditures by the company for expansion and modernization of plant facilities. The combination of higher selling prices and increased efficiency has more than offset the adverse effects of increases in wages and other operating costs.

Earnings growth of U. S. Steel and the steel industry is likely to continue to depend importantly on the trend of selling prices. Physical volume cannot be expected to grow at a faster rate than the economy as a whole. Gains in efficiency will continue but past experience suggests that this will not be enough to fully offset cost increases. The relative rate of growth in steel earnings, therefore, is likely to be determined by the trend of selling prices and the corresponding impact on unit profits.

Despite the wide price advance in recent years, steel still appears to be an underpriced metal. The postwar rise in steel prices has represented a catching up from previous depressed levels. Prices at the end of World War II were clearly inadequate. Competitive pressures forced prices downward in the depression of the 1930's and subsequent price controls during the war restricted steel more closely than most other commodities. Steel prices increased only 3% from 1939 to 1945, in contrast to an increase of 37% in wholesale prices generally.

The postwar inflation in plant and equipment costs, meanwhile, appears to have created a need for additional increases in the price of steel and in the profits of steel producers. Industry officials maintain that the cost of constructing a completely new, integrated steel plant now amounts to $300 per ton of ingot capacity, or more than twice the level of a decade ago. The cost of constructing new steelmaking capacity was a point of controversy at the recent Bethlehem-Youngstown merger trial. Bethlehem contended that the cost of constructing a new plant would be $300 a ton, while the Justice Department argued that the cost would be less than $200. A witness for the Government (an outside engineering consultant) conceded, however, that the capital cost of a multiple product plant of the type considered by Bethlehem would amount to $275 a ton, or very close to the Bethlehem estimate. If allowance is made for raw material and working capital requirements, the total investment apparently would be at least $300.

The present rate of profits in the steel industry is not considered adequate to justify an outlay of $300 for a ton of new capacity. In 1957 the aggregate earnings of seven major producers totaled only $10.75 per ton of steel ingots produced. (This is equivalent to around $15 per ton of finished steel shipments after adjustment for a 25% to 30% loss of metal in converting ingots to finished products.) At this level of earnings, the return on investment in a new plant would amount to only about 3.5%, even assuming a 100% rate of operations. A higher rate of profits could be expected on new capacity, of course, because of the greater efficiency of modern equipment (although the efficiency increment would be offset in part by larger depreciation charges). In addition, the successful development of new experimental steelmaking processes—such as direct reduction of iron ore or possibly continuous casting—might in time reduce capital costs below $300 a ton. After adjustment for these factors, however, the prospective earnings on new invested capital probably would still amount to less than 5%, and this would not be sufficient to justify the employment of risk capital in a cyclical business.

The high cost of new plant construction seems likely to result in a long-range upward pressure on steel prices. The extent of this pressure over the next several years, however, will depend importantly on the pattern of over-all economic activity. Current steel capacity of 140.7 million tons is more than adequate to supply the present needs of the economy. If the current period of reduced business activity is protracted or if the recovery is relatively slow, new capacity additions would not be needed for some time ahead. Under these circumstances, price increases probably would be limited and steel earnings would not be expected to grow at a faster rate than the over-all corporate average. If, on the other hand, the current recession is not prolonged and is followed by a resumption of normal economic growth, new capacity would be needed in the next several years to provide for requirements during periods of peak business activity. For some companies at least, expansion of capacity would require the construction of completely new plants

and this probably would necessitate a rise in steel prices. In this event, earnings of the leading steel companies could be expected to continue to grow at an above average rate.

The investment standing of the steels has experienced some improvement in recent years as a consequence of the industry's favorable performance in the relatively mild business recession of 1953-1954 and its better than average earnings record over the past decade. The Vickers compilation of the favorite fifty stocks held by investment funds shows that steel stocks comprised 10% of the total dollar value of these issues at the end of 1957, compared to a figure of less than 2% at the end of 1953. The investment stature of the industry might be expected to rise further if earnings and dividends continue to hold up relatively well through the current business recession and if the past record of above average earnings growth is maintained in the years ahead. Investor emphasis might be directed less toward the risk factor in the industry and more toward the potentials for growth—and price-earnings ratios for leading steel producers then might move more closely into line with those applied to leading companies in other basic industries.

Evaluating the Investment Management Record of Fire Insurance Companies

DOUGLAS A. HAYES

A SERIES OF ARTICLES have appeared in the *Analysts Journal* over the past two years advancing a number of ingenious techniques for appraising the investment attractiveness of fire and casualty shares. These techniques include comparing: (1) the discounts from liquidating value, (2) the price-earnings ratios based on investment income, (3) the relative growth of net asset values from reinvested earnings, (4) relative investment earnings assuming a constant annual portfolio appreciation, and (5) total earnings adjusted to "normal" profit margins.

All of these analytical concepts seem to have considerable merit and perhaps a thorough application of them to the numerous companies is sufficient to determine their absolute and relative desirability as investment media. However, there seems to be an implicit assumption running through all of these articles that while substantial differences may exist among several companies in managerial performance on underwriting operations, the capacities of investment management are roughly equal. This observation is based on the fact that no specific technique has been suggested to differentiate a superior over-all investment performance from an inferior one. In fact, Mr. Sjostrom (Which Fire and Casualty Stocks?, May, 1957) suggests that a superior performance in producing large capital gains should be more or less disregarded because the rise in stock prices over the past decade may be non-recurring in nature.

For the purpose of estimating future earnings and potential growth in the asset value of any one company, this is certainly a plausible position, as the rate of rise in stock prices from the end of 1946 to the end of 1956 certainly has exceeded the long-term average rate of appreciation in common stock prices. But the fact that one company was able to show an over-all investment performance as measured by the total of current income plus appreciation, as a percentage of the portfolio value in a base year, over a significant time span much larger than other similar companies might well be used as an indication of superior capacity to manage investment portfolios. This technique should, in brief, give some indications as to the general desirability of the stocks for investment purposes.

This is certainly not a novel idea. In the case of investment companies which manage large portfolios of common stocks comparative past management performance is typically used as the prime indication of "quality." It seems curious, therefore, that the same type of technique is not typically used to compare the relative performance of those fire companies which hold large amounts of common stocks in their portfolios. As I do not pretend to be a qualified "specialist" in the highly complex area of insurance company analysis, there may be some good and sufficient reasons why relative investment performances cannot be even approximately estimated from the available statistical data. However, in theory at least it would seem highly desirable to obtain some clues to potential capacities in this respect, as undoubtedly investment returns (current income and possibly appreciation) will provide the majority of the total earnings of the fire and casualty companies. Therefore, the following discussion is predicated on the idea that some measure of relative performance even if imperfect is better than none when evaluating any financial institution managing common stock portfolios.

INTERPRETING RESULTS

Admittedly some care would have to be exercised in interpreting any results. Some companies, St. Paul Fire and Marine, for example, have followed the policy of limiting their common stock portfolio to rather modest proportions. Others, such as Home Insurance and Fidelity-Phenix, have consistently maintained most of their stock equity invested in common stocks. Under such conditions, it would not be reasonable to conclude that a relatively poor showing of St. Paul over the past decade was due to management shortcomings. It would merely show that by hindsight a common stock policy was desirable throughout a period when stock prices enjoyed a tremendous appreciation. This, of course, is a simple truism. But for the same reason the management performances of investment company balanced funds are not comparable to common stock funds during periods when the level of stock prices is materially different at the end than at the beginning.

This defect can be partially overcome by using a span of years wherein the general market level is roughly the same at the beginning and end. Unfortunately, however, as of the early part of 1958, it would only be possible to measure relatively short-term results on this basis. Using the Standard "500" index as a guide, the period between December 31, 1954, and December 31, 1957, could possibly be used with this view in mind; this index stood at 35.98 at the end of 1954 and at 39.99 at the end of 1957, or roughly only a 11% increase was witnessed over these years. But a three-year period seems insufficient, especially when investment policies are based largely on long-term considerations, and this seems to be true of the fire and casualty companies. An eight- to ten-year performance span would seem highly preferable to measure the success or failure of investments selected for the long pull.

PROBLEMS

The major problem in measuring the purely investment performance of fire and casualty companies is the necessity to remove the underwriting results from the data. However, the following procedure, shown below for Fidelity-Phenix, would seem seem to be reasonably indicative of

the performance "relative" per share on investment operations for the nine years 1948 through 1956, inclusive:

Liquidating Value, 12/31/56	$ 91.50
Add: Dividend paid, 1948-56	12.86
	104.36
Subtract: Underwriting earnings, 1948-56	9.71
Adjusted Liq. Value, 12/31/56	$ 94.65
Liq. Value, 12/31/47	28.50

Performance "relative":

$$\frac{94.65}{28.50} = 328$$

Some brief comments on the principles underlying this technique may be appropriate. First, the use of liquidating value, defined as the reported stock equity plus 40% of the unearned premium reserve, is used in order to remove the impact of a different rate of growth in premiums written on the stock equity. While this adjustment is undoubtedly somewhat arbitrary, it is probably close enough for the purposes of this technique, which is essentially to compare relative performances rather than determine an absolute magnitude of precise results.

Second, all dividends paid must be added back to make the various companies comparable. If this was not done, the results would tend to be prejudiced in favor of those companies which had paid out the smallest proportion of earnings throughout the period covered. Third, all underwriting earnings adjusted for any increase or decrease in unearned premiums are subtracted because the intention is to isolate the investment results. The stock equity throughout reflects the underwriting earnings and while a profitable record in this regard is certainly desirable, it should not be allowed to contribute to the performance of investment management as such. Finally, the per share figures must be carefully adjusted for stock splits and dividends and for any new stock sold at prices which may have diluted liquidating value. In the case of this last possibility the simplest adjustment would be to remove both the number of shares sold and the consideration received from the entire computation.

That rather significant differences exist between fire companies in their total long-term investment results is indicated by the performance "relatives" for four companies shown in Table 1. As brought out above, however, St. Paul has followed a considerably more conservative investment policy and therefore its relatively unfavorable results are not reflective of poor investment management during a span of years when the stock market has shown great advances. Nevertheless, it may be informative to investors to realize that this company will not participate in any future appreciation of common stock prices to the same extent as other companies.

Table 1

Investment Performance "relatives"
1948-56 Inclusive

Company	Relative
Insurance Co. of North America	295
Home Insurance Company	238
Fidelity-Phenix	328
St. Paul Fire and Marine	168

PORTFOLIO COMPOSITIONS

The portfolio compositions shown in Table 2 have been derived by the procedure of assuming (1) that the proportionate share of all affiliates' unearned premium reserves and investments are properly included in the parent company's balance sheet and (2) that all common stock holdings should be allocated against the stock equity and only the residual part of consolidated liquidating value not covered by common stock holdings is invested in preferred stocks and bonds. The heavy preponderance of common stocks as a proportion of the stock equity for all of these companies except St. Paul make it quite clear that future relative investment results will largely depend on appropriate selection in this area. As performances are likely to be more varied in common stock management than when portfolios largely consist of high quality bonds and preferreds, the importance of favorable evidence of capacity is consequently increased.

A question might be raised, however, as to whether a successful past performance in the field of investment management is a reasonable clue to future relative results. In this connection there are good reasons to believe that close continuity between the past and the future is less probable in investment management than in industrial management. Superior management of an industrial company, evidenced by relatively favorable sales trends, profit margins and returns on invested capital in the past, should tend to generate a considerable amount of momentum. These factors suggest more efficient productive, marketing, and research activities which are not easy to dislodge although it sometimes does happen over a considerable number of years.

But investment management cannot attain an entrenched position at the expense of other companies. Each portfolio manager has a list of marketable securities, shown at any given reporting date at the then current market value, which can be held or switched at his discretion. The past decisions, right or wrong, have no necessary relation to future decisions. In this sense, each manager is starting from scratch at any given time. Moreover, his actions do not have any bearing on the success or failure of his competitors.

PAST CONCLUSIONS

In spite of the non-competitive nature of investment management, however, it is still my feeling that the past

Table 2

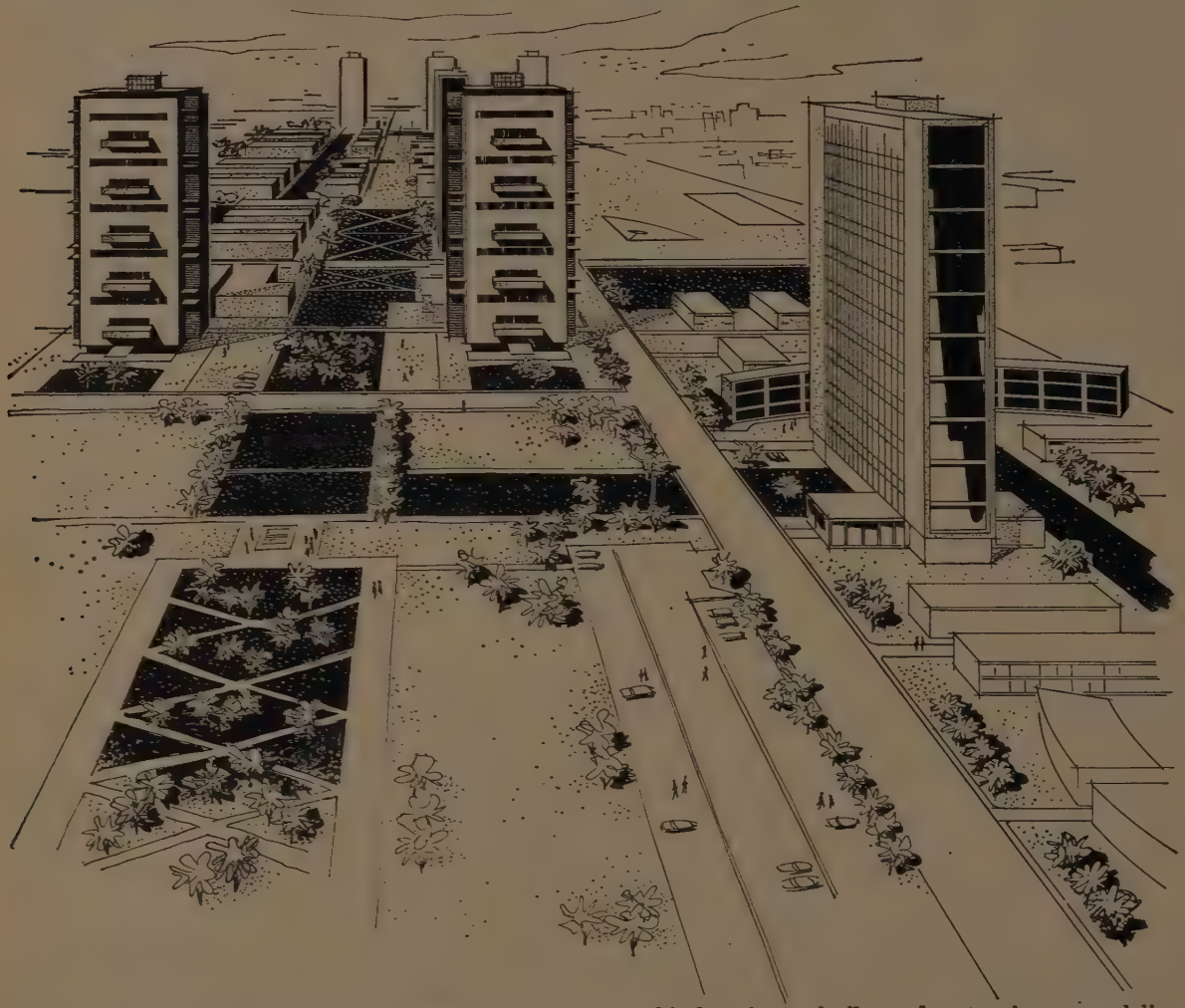
Liquidating Value: Portfolio Composition
Consolidated basis: 12/31/56
(000 omitted)

Company	Liq. Value	% Common Stocks	% Pfds. and Bonds
Ins. Co. of North America	533,993	77%	23%
Home Insurance	335,276	70%	30%
Fidelity-Phenix	363,538	82%	18%
St. Paul	154,568	44%	56%

record carries some indication of future probabilities. The past investment decisions, after all, were not made in a vacuum. Presumably they represented conclusions derived from the established policies, security research activities, and general good judgment and intelligence embodied in the organization. These factors, unless represented by one man, do not change overnight, and while the results for a single year or two might be accidental, a consistently superior performance over a number of years cannot be casually dismissed as giving no indication of greater capacity in the future.

Therefore, we conclude that evidence of relative investment management performance should be somehow incorporated into the analysis of fire and casualty companies because to a considerable degree the relative fortunes of the fire company stocks will depend on the relative success of portfolio management. Perhaps there are some inherent shortcomings in the statistical data which inhibit or even completely remove all significance from the indicated results. If so I would like to invite comments and suggestions from the number of highly qualified analysts that more or less specialize in this type of company.

ST. LOUIS' VITAL VALLEY...You won't find Mill Creek Valley on many maps, but the nation's businessmen are keeping a sharp eye on this 465 acres of land in the center of one of America's great cities...St. Louis.



Between St. Louis' downtown district and its fast-growing suburbs lies Mill Creek Valley. It is an area which has grown outmoded by the passage of time and by the move toward the west end of the city.

Now, in the new spirit of St. Louis, plans are underway to demolish nearly 2,500 old buildings in the Valley. Then, a vast and modern "suburb within the city" will begin to arise. In time, apartments, stores and industries will flourish along new, sweeping boulevards. The cost: about $300 million.

Other things are already happening in St. Louis. Three new expressways are being built. Land has been cleared for a $15 million apartment and commercial project on the edge of the downtown district. In the business district itself, new buildings are being built and extensive remodeling is under way.

In the decade just past, Union Electric, serving the power needs of this great city and surrounding area, has doubled its capacity, doubled its output. In the next five years, it will spend $290 million for more expansion. Union Electric is a growing company in a growing community where progress and profits are being built.

UNION ELECTRIC

Evaluation of Life Insurance Companies

HENRY W. STEINHAUS

IN 1951 THE STOCKHOLDERS of the Reliance Life Insurance Company of Pittsburgh received twenty seven and one-half million dollars for their stock when it was purchased by the Lincoln National Life Insurance Company of Fort Wayne, Indiana. The purchase price was twelve million dollars in excess of the book value of the capital and surplus. This sale sparked considerable trading activity in insurance stocks and in the four years following this announcement the market prices of the more active life insurance stocks, for which quotations were readily available showed increases ranging from a mere 100% to a fantastic 1,400%. Naturally, any group of stocks which showed an average appreciation of 80% a year for four years would receive considerable attention, and this group did too even from a Congressional subcommittee on the taxation of life insurance company income. In spite of the protestations of numerous eminently qualified witnesses to the effect that these quotations were speculative and did not represent true equity value, the House Ways and Means Subcommittee did not appear impressed, assuming that investors generally had a fair idea of the value of the stock they were purchasing.[1]

Following this investigation an insurance trade journal[2] commented that the Treasury is accumulating a library of glowing reports on life company stocks with which stockholders were flooding the country. projecting the most recent rates of appreciation into the distant future. and implying in instances that the sensationally profitable results are due to some tax angle. This kind of advertising can only have negative results. If the facts really were as stated how long would Congress take to apply remedies? If the facts are not as stated, unfavorable taxation might still result which then would not only affect the investors, but even more the policyholders themselves.

DETERMINING LIFE INSURANCE STOCK VALUE

How does the average investor determine the value of life insurance stocks? Presumably he has gained the impression that there must be a well established procedure because of references in the literature such as: "The equity value of life insurance stocks is determined by adding the capital, free surplus reserves, excess of market value of securities held over carrying value and estimated value of life insurance in force." The last item is perhaps shown in further detail as $15 per $1,000 of ordinary life insurance in force, $5 per $1,000 of group life insurance in force, and one-half of one year's premium of industrial life insurance in force. The only attempt for fuller explanation of life insurance stock valuation, that I have seen in print, is in the introduction to "Best's Digest of Insurance Stocks." However, this carefully worded analysis makes clear that Best's never publish figures bearing on the going value of life companies because there is no standard rule which an investor can apply to determine the value of the stock of any particular life insurance company!

In order to comprehend the difficulties involved in the use of a standard formula, we shall briefly review the individual items, illustrating with some actual examples:

1) *Capital*: The capital is the only undisputable item in the formula of values to be included in the determination of share equity. It should be noted that, since it is not necessary to increase the capital in relation to growth, one company might purchase one or more other companies and cancel out a part of the total capital. For instance, The Liberty National Life of Birmingham did that when they purchased the Brown-Service Insurance Company in 1944 and the Family Reserve Insurance Company in 1951.

2) *Surplus*: The surplus of a life insurance company is a many splendored thing. If a company were to liquidate its operations, only when the last insured or annuitant has died, and the last assets are sold, would we really know what is left over, and perhaps calculate backwards, as to the real surplus at any one time. Surplus is created by successful operation of an insurance company, but there are many claims against it, claims which are prior to that of the stockholders. For example, if an insurance company which sells ordinary life insurance policies with a 3½% interest guaranty, had distributed most of its surplus in the twenties, it might not have survived the lean years of low interest rates when the portfolio could scarcely produce 3%.

The surplus also acts as a cushion against investment fluctuations (even though sometimes special security valuation reserves are set up), against investment failures (such as that of the Missouri Life), and, often overlooked, against inflationary increases in the cost of operation. Since expense margins are fixed when the insurance is sold, added expense requirements can be met only from new policies issued with a greater expense margin, and from surplus.

Two other brief cautions: If the insurance company writes both participating and non-participating business, quite generally stockholders have by charter, or by law, as in New Jersey or Canada, no rights at all, or only very limited rights, to surplus additions arising from the participating policies. Finally, the surplus of a going company must advance the funds for new business expenses such as commissions, and the availability of the surplus may thereby govern future growth.

Frazar Wilde, President of the Connecticut General wrote to the Congressional Committee on taxation of life companies: "We in the business know that our surplus funds—far from being excessive—are on the low side. Out of gains in the business in the years when we were lucky enough to make them we must and will assign to surplus account an

1. Taxation of Life Insurance Companies. Report to the Committee on Ways and Means, House of Representatives, by the Subcommittee on Taxation of Life Insurance Companies, 1955.

2. National Underwriter, September 7, 1956.

amount which will maintain at least a proportionate surplus increase to the increase in liabilities for that year. Because the well-managed companies will not pay out this surplus to stockholders, anyone who purchases stock on the basis that they will, is due for a rude awakening."[3]

At the end of 1956 the Connecticut General's unassigned surplus represented 2.34% of admitted assets. On the other hand, when Lincoln National bought the Reliance Life, its unassigned surplus was 6% of admitted assets, presumably in excess of need. It takes a thorough actuarial, investment and expense analysis to make an educated guess as to whether a surplus is low or high, and how much of it one may safely add to equity value because it may be made available for distribution or for other purposes of indirect benefit to the stockholders. On the other hand, if the supervisory authorities believe that the surplus is not high enough, they may force the stockholders to furnish additional security in the form of paid-in surplus.

3) *Other Reserves*: There are presumably as many special reserves as names for roses, but they also have one thing in common, they are not available for general distribution. The very fact that they have been set up specifically and separately should strengthen that belief. Some of these reserves are of quite temporary nature. For instance, when the Canadian Government adjusted in 1946 the relation of the Canadian to the American dollar, giving American companies an overnight profit of 10% of their Canadian assets, the companies were required to set these gains aside, in the eminently correct assumption that this would be a quite temporary gain. In this manner many companies got a start on their "Security Valuation Reserve" or "Reserve for Fluctuation in Assets", or "Special Reserve", or "Averaging Reserve for General Investment", or whatever it may be called. Incidentally, the companies were first told to put this gain into surplus, but in 1947 the Association of Insurance Commissioners reversed itself and the companies had to pull these funds out of surplus. Any uninitiated, who would try to draw conclusions from the surplus behavior in 1946 and 1947 might come to erroneous findings!

RESERVES REQUIRED BY LAW

There are other contingency reserves required by law, such as the Group Life Contingency Reserve. There are also voluntary reserves, such as for "Interest fluctuations," or for "Future Revaluation", or for "Mortality Fluctuations." Naturally, in evaluating the size of the surplus in relation to liabilities, all voluntary reserves should be included in the surplus, particularly when one compares a company with several reserve items with one that has only one general surplus item. However, while the existence of additional reserves enhances the security of the organization and will promote further growth and success, these funds are not available for distribution except in case of complete liquidation of the company with reinsurance of the amount of insurance in force by the purchasing company. If the purchasing company has enough reserves of its own they might utilize some of the funds in these newly acquired reserves to recover part of the purchase price.

Life insurance companies sometimes have Accident and Health Departments and such additional activity may be quite profitable. If this is shown to be the case, there is sometimes added to the value of the company the profit expected from the premiums already obtained, but not yet earned, and therefore concealed in the unearned premium reserve.

No justification exists for calculating the excess of market value of company assets over carrying value as if that were concealed capital gains already in the till. Even if there was a guaranty against black Friday, capital value changes of all assets other than stocks are rather meaningless in insurance company operations. Incoming funds are usually sufficient to pay claims and expenses and as long as this condition pertains (and it is likely to continue under a growing economy), bonds will be held to maturity. but if they are sold the proceeds must be reinvested promptly. An insurance company may sell a 2½% government bond at 90, to invest in 5% mortgages and the transaction is only one of shifting assets and increasing interest. As far as common stock is concerned one should remember that the small amount now permitted in life insurance company portfolios is usually bought for diversification of permanent assets and not for short term speculation.

4) In the discussion of surplus values we hinted already that the value of a given amount may differ depending upon whether one just views the effect of such reserve on future stock dividends, or whether there may be involved a complete sale or merger. Since this becomes even more important in discussing values other than cash funds, we now enumerate briefly the various situations that may be involved.

a) In evaluating the shares of the very large life insurance stock companies average investment rules are usually applied, taking into account dividend and stock split history, management, state laws, charter provisions, long established practice as to allocation of gains to stockholders, and so on. There is no chance of sale or change of voting control, and the problem does not really differ much from other stocks. There is only one possible difference between the stock of very large stock companies and industrial stock and that is the possibility of mutualization, which may enhance the value of a few outstanding shares beyond its underlying value.

b) In medium sized companies the question of changes in control may come up. One large stock company appears to be controlled by three equal interests, so that any two groups may exercise control. Assuming for the sake of argument that the three interests hold 60% of the stock, or 20% each. One of these interests, acquiring 31% of the free 40%, could wrest control from the others. What price the last few shares to make up control?

In the case of a sale the purchaser of the majority control may make an offer for all remaining shares, (for instance to avoid leaving a strong minority interest), and such offer may be priced far above normal value. It is also possible that the purchaser wants something the selling company has, that is not obvious in the financial evaluation. When

3. Hearings before a subcommittee of the Committee on Ways and Means. House of Representatives, 83rd Congress, 2nd Session on the Federal Taxation of Life Insurance Companies, p. 96.

the Lincoln bought the Reliance Life, the Lincoln management was looking for more than just a stock investment. As the President of the Lincoln National, W. O. Menge, wrote:[4]

"In the purchase of the Reliance, a major consideration which was not reflected in the balance sheet of the company consisted of an aggressive direct-writing agency force producing approximately $100 million of new business annually. A comparable increase in our agency force in a short period of time by any other method would have been practically impossible. Even if rapid expansion could have been accomplished, it could only have been done at a considerable cost. It is generally recognized in the industry that agency development and expansion is an expensive proposition.

"Furthermore, this addition to the Lincoln field force was concentrated largely in the Southeastern States, an area in which the agency activities of the Lincoln had not been developed adequately. The Reliance supplemented our own agency force without an appreciable amount of overlapping. In my opinion the purchase price we paid for the Reliance included a substantial allowance for their agency organization.

"Another consideration in our determination of a proper price for the stock of the Reliance was the Lincoln's desire to enter the field of personal accident and health insurance. This had been under advisement in our office for several years prior to 1951, but the lack of an adequate home office staff with a background of knowledge and familiarity with this type of business had deterred us from any action. The Reliance, on the other hand, had been active in the personal accident and health field and it possessed a fine nucleus of trained home office and agency personnel. The acquisition of this personnel, through the purchase of the company, enabled the Lincoln to materially hasten its entrance into the personal accident and health field."

SMALL COMPANY ANALYSIS

c) In small companies, where there are greatly increased possibilities of sales and mergers, our analysis should start with an analysis of the owners. If it is a Texas organization known to trade in companies, one might expect another sale shortly; if it is an old established organization owned by persons with great civic pride, there would be reluctance to change, or if change is required, reluctance to surrender to speculative interests. A conservative ownership in a conservative community will usually be followed by a like ownership. A rapidly growing, successful organization may expand more easily to absorb others. In some states mergers are more readily accomplished than in others. To summarize, one should first form an opinion as to the possibilities of sales or mergers, and only then as to the value of the organization to the stockholder.

This analysis can not be complete, because the conditions of the company's insurance and investment portfolio, and home office and field organization will naturally influence sales or merger considerations. However, some of the conditions can also be expressed as a price per $1,000 of life insurance in force, and this leads us to the $15 figure often used as the value of life insurance in force.

5) For illustration let us assume that 10% of the annual premium charged by Company X represent the dividend margin for stockholders. Now, if the average annual premium (non-participating, of course, otherwise the policyholder would have some rights) turns out to be $25 per $1,000 of insurance, 10% or $2.50 represents stockholders' earnings, and capitalized at 6 times earnings would represent $15. If the average group life premium is about one third of that of the average ordinary premium, the same procedure would produce a value of $5 per $1,000 of group life insurance. If the average earnings in weekly premium insurance are set at one out of twelve premiums, 6 times earnings would be equal to 26 premiums, or one-half of one year's premiums.

While these examples perhaps explain the formula, they do not explain why, for instance, the Life and Casualty Insurance Company paid twice that much to Franklin Life of Springfield, paying $1,750,000 for a weekly business of $36,000 premiums, (February 1953). Perhaps the margins were higher. Perhaps the persistency was far above that of the average, because no profit margin is any good if the policies are lapsing rapidly due to high pressure selling or poor service. Perhaps an aggressive agency force was looking for ready made, satisfied customers who would also be prospects. Since this deal did not involve any other transfer, such as capital or surplus, there are obviously one or more of these other factors involved.

OTHER FACTORS

There are many actuarial factors involved in determining the earning power of business in force, the type of guarantees, type of legal reserves, mortality expense and lapse experience, surrender rate, maturity rates (i.e., age of policies) and all of these vary by type of policy and type of insurance, and for each type of policy often by issues, if changes have been made over the years. Suffice it to say, the use of standard figures as in the formula mentioned above (which are now closer to $20 than to $15) should be limited to a rough estimate as to how many millions are needed to bid for a company. Unfortunately there is no short cut that could be substituted for full examination of all the factors mentioned in this article.

4. Ibid, letter dated December 6, 1954.

Newport News Shipbuilding and Dry Dock Company

Profit and Loss Information for the six fiscal months ended June 23, 1958 and June 24, 1957

	Six Fiscal Months Ended	
	June 23, 1958	June 24, 1957
Gross income	$78,210,289	$81,635,167
Net operating profit	$ 4,000,625	$ 7,529,316
Deduct—Provision for taxes on income	1,875,000	4,000,000
Net profit before allowances	$ 2,125,625	$ 3,529,316
Deduct—Increase in allowances on long-term contracts	....	425,000
Net profit	$ 2,125,625	$ 3,104,316

The above information is based in large part upon estimates and is subject to year-end audit, adjustments and charges and is not necessarily indicative of the full year's results. The underlying contract estimates as at June 24, 1957 have since been revised, and those as at June 23, 1958 will be revised hereafter.

The Company's business consists largely of long-term ship construction, repair and conversion and hydraulic turbine and other construction contracts of large unit value, the performance of which may extend over periods as long as several years. A large part of the Company's business is with departments and agencies of the United States and the contracts therefor are subject to profit limitations and renegotiation to the extent that existing law and the contracts may provide and, in some cases, to termination at the convenience of the Government.

The Company records profits on its long-term shipbuilding contracts through estimates on the percentage-of-completion basis, and on its other long-term contracts as billings are made thereon. The profits so estimated and recorded are reduced by such allowances as may be considered advisable, taking into account the stage of completion of each contract, possible increases in costs not included in the estimates, guarantee liabilities, unsettled contract adjustments and other factors. The amounts reserved as allowances reflect the reductions in Federal and state income taxes which would result if the matters covered by the allowances materialize. To the extent that the matters for which the allowances were provided do not materialize, the allowances are included in income. If such matters materialize in amounts exceeding the allowances provided therefor, the excess will reduce income in the year in which such matters materialize. Federal and state income taxes must be paid for each year upon the profits as estimated and recorded without consideration of the allowances. Such allowances aggregated $3,125,000 at June 23, 1958, December 31 and June 24, 1957 and $2,700,000 at December 31, 1956.

Income from other contracts and orders is estimated and recorded as billings are made under the contracts or recorded upon completion of each contract.

Quarterly Statement of Billings, Estimated Unbilled Balance of Major Contracts and Number of Employees

	Six Fiscal Months Ended	
	June 23, 1958	June 24, 1957
Billings during the period:		
Shipbuilding contracts	$61,819,876	$50,256,430
Ship conversions and repairs	12,434,597	20,273,195
Hydraulic turbines and accessories	3,180,095	1,001,090
Other work and operations	5,675,599	8,672,639
Totals	$83,110,167	$80,203,354
	At June 23, 1958	**At June 24, 1957**
Estimated balance of major contracts unbilled at the close of the period	$380,627,622	$344,610,460
Equivalent number of employees, on a 40-hour basis, working during the last week of the period	11,470	12,874

The Company reports income from long-term shipbuilding contracts on the percentage-of-completion basis; such income for any period will therefore vary from the billings on the contracts.

By Order of the Board of Directors
R. I. FLETCHER, *Financial Vice President*

July 23, 1958

The Glass Container Industry

CORIOLANUS

CUMULATIVE FIGURES going back over a long period in the packaging industry are hard to come by. It is possible, however, to find out where glass container manufacture stands today, by comparison with, say, twenty years ago.

Despite new materials, new fads, new fancies in packaging, even though packaging as a whole has soared from $1,690,000,000 to over $10,000,000,000 per year, glass containers still account for approximately the same percentage of the total market (8 per cent) as they did about twenty years ago.

As a matter of fact, in 1957 the glass container business became a billion dollar industry for the first time, with a dollar volume of $784,000,000 in containers and $274,000,000 in closures. In unit figures that represents some 20.2 billion containers, or 118 bottles and jars for every man, woman and child in the United States.

Thus far in 1958 United States Department of Commerce figures show that for the first four months shipments of new glass containers reached a record total of 6.3 billion units, some 2.4 per cent over the comparable 1957 period, with most of the increase accounted for by soft drink bottles, food containers and beer bottles. By any measure this is a satisfactory performance in a recession period.

Production figures—whether for this year, or last, or back about forty years when the industry penetrated the mass production field—evidence that glass containers are in immediate use by everyone from morning to night, for one or another among a great range of needs and conveniences. For the very reason that they have become so routine to daily living, we tend to take them for granted, and know little about how they came to be, how their use began and has grown.

GLASS AN OLD MANUFACTURED SUBSTANCE

Glass is the oldest manufactured substance on earth and, indeed, America's first industry. It did not, however, have to wait for the hand of man; Nature got there first. The New Testament records that lightning struck sand and caused glass. The Book of Revelation says, "And out of the throne proceeded lightnings . . . and before the throne there was a sea of glass, like unto crystal. . . ."

Red hot lava, pouring over the lip of a volcano, can form glass, depending on the molten constituency and the rate at which it cools. Obsidian is a natural glass. Indians and cave dwellers used it for knives and arrowheads.

The raw materials of glass are sand, that is silica, soda ash or sodium carbonate, and limestone. Small quantities of other materials are added for specific purposes. Cullet, or crushed glass, makes the ingredients more workable. Other supplements make finished glass stronger, able to resist temperature changes, furnish transparency or color.

It is sometimes pointed out facetiously that the moneyworth of chemical and other substances constituting the human body is 80-odd cents. Raw materials for making glass are comparably inexpensive. Sand covers a considerable portion of the earth's surface; being available in practically inexhaustible supply, it is low in cost. Cost-wise so are soda-ash and limestone.

Ready availability of low-cost raw materials, combined with ever-improving manufacturing methods within the industry, keeps glass containers competitive from a cost standpoint. According to United States Government figures, glass containers are being sold at an average cost of $131 per ton. This is substantially less than the delivered price of a ton of bleached kraft food board, $200 at the mill; or of tin plate, $206 per ton. It is even cheaper than the quoted price of newsprint, $134 per ton in New York. Bear in mind that the $131 per ton is for finished, accurately dimensioned glass containers, all made up and ready for filling. Few if any products in the world stand in less danger than glass of either runaway cost or shortage of raw material.

Historically, Phoenician merchant sailors may have been the first, if inadvertent, producers of glass. Not finding rocks on a beach to build a fireplace to cook their meal, they used lumps of natron from the cargo of their vessel. The fire, melting the natron (soda ash) with the sand, formed a residue, glass.

It might be supposed that clear, colorless glass came first, colored glass second. It was the other way round. Getting color out of glass was the later discovery, the refinement.

There were two early methods of making glass containers. In one, glass was pulled in fine threads with a metal rod from the kettle of molten material, the glass then wound, strand by strand, around a sand core, which, after the glass hardened. was scraped away. By the other method a sand mold was dipped repeatedly in molten glass, each layer being shaped with a wooden paddle. Incidentally, this well may have been the beginning of lamination. At any rate, glass was made in these two ways for hundreds of years.

The mass production beginnings of the glass container industry came in America in 1903 with Michael Owens' invention of the first automatic bottle machine. He had been working on it since 1899. He aimed to reduce the tedious labor of glass blowers and their assistants, and also the skill hitherto required of glassblowers, for the hand process.

In 1917 the "gob feeder" came into wide use, completing the conversion of glass container manufacture to a fully automatic process.

What is the process in a typical modern glass container plant?

Raw materials are weighed on automatic scales, and mixed in batches to a precise formula for producing a given type of glass.

INGREDIENTS OF GLASS

As always, the principal ingredients are silica sand, soda ash and limestone. Normally cullet is added to the batch to speed melting and cause ready fusing. Smaller amounts of other chemicals—cobalt, chrome—are mixed in for special properties.

The batches are fed into the tank, or gas-fired furnace maintained in continuous operation. At temperatures above 2700 degrees F. it receives the batches of dry material at one end, discharges molten glass at the other. This trial by fire produces glass of required uniformity and purity.

The gob feeder is the device for feeding "metal," as glassmakers refer to molten glass, to the machines. The metal passes from the tank, on a level above, to the automatic feeders. The red-hot glass, taffy-like in consistency, flows downward through an orifice and, when precisely the desired amount has passed, is cut free by mechanical shears. The "gob" falls into a waiting mold mounted on a movable arm. This mold moves automatically to the next station; another mold moves into place to receive the next gob.

In the rough mold the gob is blown and pressed automatically to the approximate shape of the finished bottle. It is transferred by mechanical jaws to a finishing mold which closes around it, and compressed air blows the glass to its final shape. The mold then opens, mechanical arms move the bottle to a conveyor which carries it through a long, tunnel-like oven—the annealing lehr—where, as the container moves along, its temperature is decreased gradually. Controlled cooling produces greater strength in glass. When containers are inspected, before packing, any not perfect are broken and turned back as cullet.

It is enlightening to compare processes. Early in this century, when methods of food preservation caused a rising demand for glass containers, one glassblower, working 12 to 14 hours a day with four assistants to shift molds and do other necessary jobs, could turn out 200 bottles in a day. Where, as recently as 25 years ago forerunners of present-day machines still could produce only 30 to 40 glass containers per minute, today's fully automatic machines may turn out more than 200 per minute. The day is not too far off when the machines will turn out 700 or more units per minute.

It is not generally realized that the packaging industry is the nation's ninth largest. Its annual dollar volume is exceeded only by such giants as the automotive, petroleum, and aircraft industries. The steel industry ranks eleventh.

As already noted, glass containers account for 8 per cent of the total packaging market. At one time the "glass belt" took in a band of states extending from New York, New Jersey and neighboring coastal states, through an area rich in sand and fuel to the Mississippi River. Today there is a growing spread of plants, as far south as Florida and Texas, as far west as California and Washington State.

The bulk of glass container production falls into two major categories—wide-mouthed and narrow-neck—and into four major packaged-product fields: food, beverage, drug and cosmetic, and household and industrial chemicals.

In recent years new production and sales records of glass containers have been increasing at the rate of about 5 per cent per year. The growth factor in glass containers outstripped that of both metal containers and folding box board for the period 1928-1956. For the full span 1928-1956, the glass container index (1928=100) increased to 440, that of folding boxboard to 433, that of metal containers to 298.

GLASS CONTAINER AS A PACKAGE

Glass is insured by its chemical inertness against taking anything from or adding anything to a food or other product packaged in it.

Visibility satisfies the instinctive human desire to see contents, to know what is being bought. The fact of being able to see, not only the product but how the supply is holding out, has unquestionably been a big factor in the capture by the glass container industry of virtually the entire instant coffee market; along with the fact, of course, that instant coffee in a glass container can be resealed quickly and easily, thereby maintaining flavor and freshness.

A glass container becomes a useful package to its packer only when it is properly capped, sealed or otherwise closed in keeping with the best requirements of its contents. Thirty years ago there was no standardization of finishes. Consequently the closure man had to know who was going to make the glass and vice versa, before either could know what to make. Time had to be spent in exchanging samples and very often altering either or both.

"Standardization of finshes" means reconciling design and practicality. Glass container design in effect recommends dimensional proportions, contours and design features which are practical from the manufacturing standpoint of the product to be contained. Closures are designed for fit with maximum protection and convenience. Today the closure and the glass container maker may never come together; already finishes are highly standardized and the industry is working constantly to make them more so. Thus are closures indivisible in the industry; glass containers are only completed with the means to render contents spill- or spoil-proof. The seal must be so positive that contents cannot escape or outside substances enter. At the same time the consumer must be able to open the closure quickly and easily and, if necessary, to re-seal the bottle or jar many times.

THE PACKERS' CONCERN

Packers are concerned with three main factors: "the finish" on the container itself; the gasket, or liner, which forms the seal; and the cap, which may be pry-off, crimp-on (crown, or milk bottles), shaker-disc, or other types.

Originally closure was pretty much confined to corking. Now it is based on a wide variety of principle and design—screw-thread, lug, crown, pry-off, and the various friction finishes; and the "corkage" feature for plastics, rubber or cork stoppers.

There are over fifty manufacturers of closures in the United States and one in Canada.

No more convincing examples of the importance of closures are to be found than those for instant coffee and baby foods.

In 1939 only 13 per cent of baby foods were packaged

in glass. It is estimated that at the end of 1957 more than 75 per cent came in glass, almost completely revolutionizing baby foods packaging in just eighteen years. More babies, more eating of baby foods, with figures still further increased by baby foods-eating by dieters, oldsters, live-aloners and miscellaneous others.

The re-sealing feature is all-important to glass-contained baby foods. Jars can be re-sealed and stored in the refrigerator with complete assurance of maximum preservation. Combined with the unchallengeable cleanliness of glass containers, this re-sealing advantage accounts for the tremendous rise in glass-packaged baby foods sale.

COMPETITION TO GLASS CONTAINERS

The major portion of the packaging industry is shared among six types of packaging material: paper and fibre containers, steel containers, glass containers, wooden containers, plastic packaging, and aluminum packaging.

In 1939 the paper milk carton was introduced on a volume basis in supermarkets. This was unmistakable competition for the faithful old milk bottle. People wondered, did it presage the end of glass-bottled milk?

Some 90% of home milk delivery is still in glass. In point of fact, the glass container industry is today selling just as many milk bottles as it did in 1939, and market studies in leading cities indicate that glass milk bottles are returning.

The beer can had come along in 1935. Would that finish beer bottles? Well, the glass container manufacturers came up with emphasis on the quart beer bottle and in 1938, with no-deposit, no-return beer bottles too. Wartime metal shortages contributed to rising percentages of glass-contained beer and soft drinks. Today 65 per cent of packaged beer is bottled in glass. Today five times as many beer bottles are being sold as were sold twenty years ago, at the time the beer can was introduced. This is attributable in no small degree to the growing use of the no-deposit bottle in place of the returnable bottle, which averages 21 trips. The 1957 ratio of domestic shipments was almost four non-returnable to one returnable. Thus have consumers indicated a willingness to pay extra for the convenience of the non-returnable beer bottle.

It is estimated that in 1957 Americans consumed 190 bottles of soft drinks per capita, or a total of 32,363,000,000. Almost seven returnable soft drink bottles were shipped that year for every one non-returnable. Noteworthy, however, is the fact that, while shipments of non-returnables for soft drinks are still comparatively small, they have grown steadily from their introduction in 1948.

The industry is thoroughly alert to the fact that glass containers must be kept economically competitive. That means they must be produced by high-speed, low-cost operations; be available in about any size and shape, fitted with a closure of maximum effectiveness and equipped with any type of dispenser, from eye-dropper to aerosol top.

Over the last ten years the glass container industry has spent an estimated $100,000,000 in research, the kind of research that slowly but surely gets out the bugs. For example, weight of containers and strength of glass have been prime problems.

The easiest criticism of glass containers is "they break." There is some pretty convincing, perhaps to many surprising, evidence to offer in rebuttal.

By comparison with paper, plastics, even metal, glass containers admittedly are heavy, often heavier than the industry would wish. Greater glass strength with less weight is an objective being worked on steadily and with demonstrable progress.

The typical pre-war quart bottle weighed some 22 to 24 ounces. The same bottle today weighs 15 to 17 ounces. Quart jars which 25 years ago weighed 18 to 20 ounces today weigh 11 to 13 ounces.

The modern glass container long has been capable of withstanding much more abuse than is commonly understood. In this connection a recent report of the Transportation and Fibre Box Associates notes: "Freight claims on foods and beverages in glass averaged only $10 per car, against $55 per car for juices in tin, and against $44 for fruits and vegetables in tin."

It should be emphasized that this is not to say that canned goods have bad shipping characteristics. They do not. Yet, speaking for glass containers, railroad checks indicate that freight claims on products shipped in glass are today lower than the average of claims on all commodities shipped in other materials. The average of claims on products shipped in packaging of miscellaneous types is $29 per car, compared with claims of $10 per car on shipments in glass. One obvious reason for the lower breakage rate is constant successful research in strength and durability.

The industry is aiming to raise the utilization of inherent glass strength. So far only about one per cent of the measurable laboratory strength of glass is being utilized in making glass containers. It is known that ordinary glass fibres show tensile strengths in excess of 300,000 pounds per square inch.

Coatings and other surface treatments applied to glass likewise are receiving concentrated research attention within the industry.

"Wax" coatings, such as stearate and glycol, do not—as does sulphur—chemically change the glass surface, but are primarily lubricating in action, reducing scratching of the dry bottle surface; losing the lubricating properties when wet, washing readily removes the coating.

There are many other improved coating types, all in line with making glass containers constantly more economically functional.

AS COSMETIC CONTAINERS

In the cosmetic industry manufacturers recognize the degree to which the glamour-appeal of their products is enhanced by glass containers, which—lending themselves to all sizes, shapes, colors and design—contribute a powerful psychological element of high style and sparkle.

Between 1930 and the end of 1957 the rise in millions of gross glass container shipments for cosmetics and drugs was from slightly above ten to just under thirty-five. Prior to 1944 (as with wines and liquors) neither manufacturers nor Government agencies reported container shipments

separately for drugs and toiletries. Subsequently, however, they did.

In 1957 domestic shipment of bottles and jars for medicines and drugs were 22,654,000 gross (3,262,176,000 units), or 16.2 per cent of the total. And 12,576,000 gross (1,810,944,000 units) for toiletries and cosmetics; all told, 9.0 per cent of total glass container shipments.

The fact that no other material is inert, as glass, to the action of so many and different chemicals, explains the practically universal use of glass for chemical laboratory equipment. Correspondingly, glass is high on the preferred list of materials to package household chemicals such as ammonia, bleach, ink, insecticides, furniture and silver polishes, radiator compounds, and the like. Industrial chemicals packaged in glass include acids, dyes, glues, reagents and solvents. According to United States Department of Commerce figures, glass container shipments for household and industrial chemicals have risen from just below 2 millions of gross in 1930 to just above 12 millions of gross for 1957.

Glass is the only packaging material found feasible for wines and liquors up to the present time. Virtually 100 per cent of all wines and liquors are glass-packed. Domestic shipments of glass containers for wine rose, in thousands of gross, from 2,738 in 1944 to 4,564 in 1957. For liquor, in thousands of gross, from 6,624 in 1944 to 9,476 for 1957. In latter category highs of 10,413 were reached in 1946, and 10,115 in 1956.

For all uses per capita domestic shipments of glass containers ranged from 31 in 1932 to 118 in 1955 through 1957.

Besides research and dynamic selling, the glass container industry is maintaining a close watch on rising, and new, markets. Intensive studies of consumer attitudes go on all the time. The industry not only knows what people prefer in packaging now, but what they liked a year ago and, to a considerable extent what they will like next year, and why.

One example indicates the prime importance of such studies. As early as 1954 they showed a large unsatisfied preference for glass-packaged intermittent-use products, such as spices, ice cream toppings, ripe olives, instant products and salad oils. By designing proper styles and sizes of glass containers, salad oils and instant coffee have virtually become all-glass packed. Packers of spices are rapidly following suit, by moving into glass.

Ninety-nine per cent of the glass products made in the United States today are made by processes that were unknown at the turn of the century.

Bottles now whirl off mass-production machinery at the rate of some 250 per minute. About twenty-five years ago similar machines could only produce 30 to 40 per minute. Improvements will come all along the line, but they will never come easily. Many in the industry feel that that is half the fun. Advancements of all sorts, kinds and description are on the way—the lightening of wide-mouth jars by 20 per cent is just one, for example.

The impelling forces behind changes and advances are study and hard work. The glass container industry is naturally interested in where it has been. But it is not resting on any past records.

It is more interested in where it is going.

Economic Forces Contributing to Inflation

DR. REUBEN E. SLESINGER

NOW THAT NEARLY ALL the economic indicators have shown downward movements for several months, it is well to stop and inquire whether the American economy was characterized by inflation until recently and what have been the causative factors blamed for the high levels that caused concern through most of 1957. To begin with it is necessary to correct a common fallacy that a mere rise in prices constitutes an inflation. Inflation is a relative concept. To characterize a period as inflationary, it is necessary to examine not only price levels but other quantitative measures such as gross national product, disposable personal income, supply of money, and the like. Adjustments also must be made for rates of growth. Were those factors not taken into consideration, it would be possible to describe even some of the most devastating depression years of the 1930's as inflationary by using a base far enough removed during which prices were lower, such as some nineteenth century period, for example, 1890.

That such comparisons are essential is self-evident if for no other reason than the number of welfare or value connotations attached to the idea of "inflation." Thus if certain public policies are to be called into play when an inflationary period is present, and correspondingly if certain vested interests are to be affected favorably or adversely, it is imperative that the period be truly inflationary and not just a surface emanation of higher prices.

HINDSIGHT VALUABLE

Perspective and hindsight are valuable tools for economic analysis. And so it is now that we are in better position to review some of the economic phenomena of the last few years to determine to what degree various factors operated in a manner that has contributed to the present slackening in economic activity. It is not enough to point to gross national product or like measures and indicate that they are so many percentage points below last year or another peak year. Only to keep even with the past is to fall behind, since there is a rate of growth that also must be considered. For example, if GNP were $430 billion in one year, just to sustain the established rate of growth of between 2½ and 3 per cent would require a GNP for the next year of between $441 and $443 billion to maintain an even keel. Changes in prices, too, must be given full consideration. For example, although the dollar value, in current dollars, of the gross national product advanced some 5 per cent in 1957, approximately 80 per cent of this was due to price increases, thus leaving a true increase in physical product of only about 1 per cent below the established rate of growth of the economy.

In searching for the defendants who might be accused of generating run-away conditions during the year prior to late 1957, there is lack of agreement among neutral economists, aside from particular disagreement between business, labor, and government economists. Nevertheless, it is possible to review some of the economic sectors generally accused by a grand jury of opinion, professional and otherwise.

Labor has been singled out by many as the basic stimulant responsible for the high prices of the past decade. It is argued that, since World War II, wages have risen more rapidly than labor productivity. Hence, a pressure on prices develops in that enterprisers are able to pay higher wages only out of two sources: increased productivity or increased prices. The argument that increased volume at lower prices may keep revenue from falling is based on increasing productivity; if this is not the case, then prices will advance. An implicit assumption is that the existing distribution of the gross national product bars the entrepreneur from taking the increased share of labor away from other agents of production. These too—aside from profits—have rates determined in the market place.

Data supplied by the Department of Labor support this argument, especially the fact that non-agricultural wages have outrun productivity by approximately 30 per cent since 1946. Not only have direct wage payments risen, but rapid increases in costs have accompanied the numerous fringe benefits won by labor since 1946. In further support of this argument, evidence is presented in a study of productivity conducted by the Joint Economic Committee.[1] This study estimates that compensation of all employees per unit of output for all manufacturing industries rose some 130 per cent from 1939 to 1956, but that wholesale prices of finished goods advanced only 109 per cent during the same period.

This comparison is pointed out in answer to organized labor's contention that it was rising prices that caused wage rates to increase, rather than the reverse. Although the facts for the longer period do not support the labor argument, there were some years during which prices advanced more rapidly than wages. On the other hand, during most of the last few years, real wages also have increased. Between 1953 and 1956, money wages rose some 8 per cent while the consumer price level was relatively stable.

For 1956, output in manufacturing advanced less than 3 per cent in face of an increase of some 5.3 per cent in wages, not considering fringe benefits. The Joint Committee pointed out that, for non-agricultural enterprises, unit labor costs advanced 4.5 per cent in 1956 in face of virtually no increase in productivity in this sector.

The year 1957 brings further testimony to bear on the part played by high and increasing wages on rising prices. During that year many prices—especially for raw material goods—declined sharply although wage rates in these areas did not change much. Employers reacted, to a large degree, by reducing their labor force. It is interesting to note

1. "Productivity, Prices, and Incomes," Joint Economic Committee, United States Government Printing Office, Washington, D. C., 1957.

also that those industries in which wage rates are relatively high, such as manufacturing, have exhibited a greater price rise than the raw material industries where labor rates are comparatively low.

Thus it is, so far as labor rates are concerned, we may conclude that wage and labor costs constitute an inflationary factor to the extent that they increase at a rate in excess of the rate of increase in industrial productivity. Some analysts who accept the labor cost inflation idea look for price rises during 1958 as a consequence of increased labor costs following a number of contract negotiations scheduled for the summer and autumn of the year.

BUSINESS PROFITS

As another defendant, business profits have come in for a considerable degree of blame for the price advances of recent years. Most organized labor and consumer groups as well as a number of government economists have singled out this sector of the economy as the main culprit.

In following the argument of this group, we find generally that businessmen are accused of pushing up prices in order to earn greater profits. Further, it is alleged that gains emanating from increased productivity are retained by enterprisers by way of increased profits instead of absorbing wage increases, hence the increase in prices to yield greater profits. This argument overlooks the basic theory of profits as well as much of the data on profits.

Unlike wage or interest costs, profits as a return for enterprise ability are not determined in a market in which factors of production are priced such as is true for labor or capital use. The businessman will find that profits basically are a residual return, aside from a certain amount of what may be termed "reasonably necessary" profits in order to induce an entrepreneur to assume the obligations and risks of business ventures. As such, it is not the higher profit yielding businesses that determine the amount of profits earned by a specific firm. Rather it is the marginal, high cost, low profit firm that exerts the basic influence on price, and the higher profit yields inure to the more effective firms that have been less responsible for the price rise in the first instance.

Further, there is considerable confusion in the measurement of profits. As a business return, profits range from a lucrative percentage in some sectors of the economy to negative (losses) in others. Quite diverse conclusions will follow, depending on how profits are measured. On the basis of actual dollars earned, for example, corporate profits were at a record level in 1956. But it must be remembered that gross national product also recorded a new high in 1956. Actually, on the basis of physical units of manufactured output, profits have declined since the end of World War II. As a percentage of total costs, profits before taxes declined from 1955 to 1956, during which time all costs, including labor costs, rose. A common guide as to the profitability of a firm or an industry is the percentage of profits to sales. Since 1955 this percentage has been declining for manufacturing companies both before and after taxes. It is of interest to note that according to Department of Commerce data corporate profits before taxes were 10.4 per cent of GNP in 1956 and 9.2 per cent in 1929. But on an after tax basis the percentages dropped to 5.1 in 1956 and to 8.0 in 1929. The corresponding figures for 1950 were 14.0 and 7.8 per cent. Meanwhile, compensation of employees increased from approximately 49 per cent of GNP in 1929 to slightly over 58 per cent in 1956. Supplements to wages and salaries have risen from an insignificant figure in 1929 to some 3.4 per cent of GNP in 1956. Thus, it is clear that inflationary tendencies during the last decade cannot be blamed on profits accounting for an increased share of the national product.

PROFIT RATES

These generalizations with reference to profit rates must be qualified industry by industry as well as firm by firm. For some individual industries and firms profits have increased substantially, but for others much the contrary is true. A further fact in passing judgment on the guilt of profits is the fact that as a percentage of total industry costs or of gross material product, profits constitute a small item. Hence, even if profits had been increasing as a percentage of the total (a fact untrue for the past decade) their contribution to rising prices would not have been significant. In summary, so far as business profits are concerned, we may conclude that when price rises exhibit a rate of increase in excess of costs, profit margins will advance. But when prices lag costs, profit margins will diminish. Data for the past decade, and for the past few years particularly, depict narrowing profit margins. This takes on more significance too in view of the fact that increased sales volume during this period could have been expected to increase profits. Thus it is that accusations against profits as the causative factor for inflation are unfounded.

The businessman has been accused of contributing to inflation from another approach, namely, his pricing practices. Considerable discussion of industrial price policies has followed since the Kefauver committee hearings of 1957 emphasized the idea of administered prices.[2] These prices are alleged to be set by enterprisers who enjoy so much market domination as a result of concentration or other advantages that they may manipulate prices in an upward manner to yield greater profits even in spite of a declining demand.

It is contended that companies that are able to administer their prices do so without due regard to the market conditions of supply and demand. Further, it is argued that their dominant market position—oligopolistic power—allows them to demand a higher price than the free interplay of demand and supply in a purely competitive market would support. Here, once again, there is a failure to observe the operation of the basic laws of economic pricing. Regardless of the power of a dominant (oligopolistic) producer, there is a limitation exerted by customer demand.

Furthermore, numerous studies (especially by Professor Jules Backman)[3] show no significant relationship between the degree of concentration in an industry and the upward

2. For a complete discussion of administered prices see Backman, Jules, "Administered Prices," New York, 1957.

3. Ibid. "Administered Prices."

movement of prices, especially in the post-World War II decade. As a matter of fact, the reverse often is true, that the most highly concentrated industries frequently show the least increase in prices. Attention also should be directed to the fact that the presence of administered prices does not mean necessarily that such prices are inflexible. In fact, many administered prices show a marked degree of flexibility, indicating that something aside from the power of administration is responsible for a particular level of prices.

Professor Backman examined the 92 subgroups included in the wholesale price index and classified 78 as administered. Of these 78, prices between June 1955 and June 1957 showed a widely diverse pattern; for example, 12 were characterized by price declines, 3 had no price changes, 12 showed a rise of less than 3 per cent, and 10 demonstrated a price advance in excess of 15 per cent. As further demonstration that price administration does not mean for certain price inflexibility and prices advances, we may cite the case of non-ferrous metal (lead, copper, and zinc) prices during the last two years. When demand and supply conditions so dictated these prices rose rapidly, but now that demand and supply conditions indicate otherwise, prices have dropped as sharply.

Further data[4] indicate that there is no significant relationship between the degree of concentration and price changes. Price increases may be found in areas where concentration is low as well as where it is high. Concentration in itself thus cannot be found guilty of causing price inflation.

Let us now turn to another sector of the economy-spending-consumer expenditures and gross private domestic investment to determine its degree of guilt. The upsurge in private demand, both by ultimate consumers and businessmen, has been dramatized since the mid-1940's. Many government pronouncements during 1957 implied that excessive spending by individuals for consumer goods and by businesses in the capital goods markets was the basic cause of rising prices. In fact, much of the Federal Reserve policy of tightening money and generating an atmosphere of psychological caution was based on the assumption that excessive demands were producing price rises through their pressures on supply.

The recovery that got under way after the readjustment of 1953-4 was sparked by consumer expenditures. The groundwork for price pressure was laid by tremendous amounts of consumer expenditures with a rapid increase in consumer installment financing and credit. During 1956 and 1957 the rate of increase in such credit subsided, but the volume outstanding continued high.

PERSONAL CONSUMPTION

Personal consumption expenditures accounted for 83 per cent of personal income and over 94 per cent of disposable personal income in 1955. These represented an increase of about 1 per cent in each category over 1954. By 1956 the percentages had receded approximately to the 1954 levels. Consumer installment credit increased some 20 billion dollars between 1950 and 1956, showing a rise of almost 6.5 billion dollars between 1954 and 1955 and an added increase of 3.2 billions in 1956. This rapid expansion meant an increase of some 30 per cent in consumer credit over a two-year period, whereas disposable personal income was advancing by only about 13 per cent at the same time. Hence the pressure on prices. Although the upsurge in consumer credit was not so strong after 1955, much of the damage already was a matter of history. It must be remembered that the actual levels of consumer demand continue to be high. Personal consumption expenditures increased by approximately 5 per cent between 1955 and 1956.

So far as the capital goods market, including inventory accumulation, is concerned, the boom in producer goods areas in 1954 through 1956 did exert a significant price pressure. Gross private domestic investment surged from $48.4 billion in 1954 to 65.9 billion in 1956, an increase of approximately 36 per cent. Changes in business inventories increased to a level of $4.6 billion during this period. Such rapid increases in capital investment have a magnifying effect on the economy because of the operation of the multiplier principle. Specific increases in capital goods demands will generate larger relative demands for other goods as the secondary, tertiary, and other influences manifest themselves.

If we are to assess inflationary blame through 1956 the pressure exerted by booming capital goods demand may be found quite contributory. But by 1957 most of this pressure had subsided as plans for capital expansion were curtailed. In fact, this curtailment is one of the prime factors responsible for the 1957-8 readjustment. There is little doubt, then, that capital goods spending is a key element of our economy and that the big boom in this area was one of the direct factors contributing to the recent inflation.

We now look at another segment of the economy—government. Here we must assess influences from several points of view; namely, the repercussions of government spending programs, the effects of government fiscal policies, and the nature of government monetary policy. With reference to government spending, we note a continuous rise in government outlays, with minor interruptions, during the past decade. Federal government purchases of goods and services rose from $22.1 billion in 1950 to $47.2 billion in 1956. Meanwhile similar state and local outlays have advanced during the same period from 19.9 billion dollars to 33 billions. In fact, there has been no year since 1950 that the state and local outlays have not risen, thereby offsetting declines that have taken place at the federal level in some years.

These governmental outlays may have varying effects on prices, depending much on the techniques of financing used by public bodies. To the extent that taxation is used to finance public expenditures it may be possible to reduce inflationary possibilities of government spending if more money is taken in by way of taxation than is poured out by way of various spending programs. The diminution in federal outlays contributed to the 1957 downturn and there are many who look for a resumption in these outlays to spark an upturn in 1958.

If the governments finance their expenditures through

4. See Report of the Subcommittee on Antitrust and Monopoly to the Senate Committee on the Judiciary, "Concentration in American Industry," United States Government Printing Office, Washington, D. C., 1957.

borrowing and other techniques of deficit financing we have a real inflationary force introduced into the economy. This is closely related to the entire monetary and fiscal policy of the government. There are many, including the Board of Governors of the Federal Reserve System, who argue that the most important factor in causing recent inflationary tendencies has been the tremendous increase in the supply of money during the last ten years.

It is this belief that prompted the Reserve System to adopt various money-tightening policies in 1956 and 1957. In fact, many who adhere closely to the Reserve thinking argue that these actions were taken too late. Although the money reins have been kept fairly tight in the last two years, so much money and monetary liquidity was created in prior years that many of the inflationary repercussions still remained in the economy. Not only is the actual quantity of money in circulation (currency plus bank demand deposits) significant, but also its velocity or rate of turnover is very important. Keeping the actual quantity of money stable will not suffice if velocity increases. The annual rate of turnover of bank deposits in New York City rose from 31.1 in 1950 to 45.8 in 1956; for six other cities the corresponding rise was from 22.6 to 28.8; for 337 other reporting centers the increase was from 17.2 to 21.8.

DEMAND DEPOSITS

Demand deposits, on the other hand, increased much less during the same period, rising from approximately $92 billion to about $110 billion in 1956. Meanwhile the amount of currency in circulation increased even less, rising from about 28 billion dollars to slightly over 31 billions. Hence the significance of velocity changes that have increased so rapidly as a basic contributor to inflation. This accentuates the problem of monetary control, since it is more difficult to control velocity than quantity. If consumers and businessmen want to spend and especially if the marginal efficiency of capital is attractive spending will follow, and in its wake will come inflationary tendencies such as of 1954-6. A ten billion dollar increase in demand deposits of $100 billion appears at first approximation as a 10 per cent increase in the quantity of money, but if velocity increases by only four at the same time the real increase in the quantity of money is magnified.

NO SINGLE CULPRIT

It is apparent from a review of the foregoing possible defendants in the trial of inflation that it is not easy to determine the true culprit. Some guilt rests in each sector of the economy, the businessman, labor, the public, and government. Since each interest group in the economy is affected differently by inflation, it is common for each to accuse the other of the prime responsibility. A scientific approach to the problem of cause must keep in mind the fact that there may be many contributing forces and that each may have different repercussions under different economic environments.

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The Effect of Inflation on the Stock Market

ADAM I. DEDALUS

INFLATION IS A STORY we are constantly rehearing. In 1947-49 we heard that non-recurring inventory profits and inadequate depreciation reserves for replacement of assets had resulted from inflation, so that earnings were over-stated and ought to be discounted. An average price-earnings ratio for the Standard & Poor's Industrial Index of 19.0 in 1946 declined to 9.8 in 1947 and to the abnormally low level of 7.7 in 1948, because of investor recognition of inflation. This cause was cited until recently to justify the abnormally high price-earnings ratio for this Index of 13.6 in 1956 and 13.65 in the last week of August, 1957. Is there no rational way to allow for the effect of inflation on the value of stocks?

Sumner Slichter, of Harvard, predicts a steady, creeping inflation of a few per cent a year. Others, too, regard it as inevitable.

HISTORIC INFLATION

There is a long historic increase in the price of gold as a proof that inflation cannot be held back. The price of an ounce of gold in the United States has increased from 50 cents to $35. This 70-fold rise appears monumental until one computes the annual inflation rate, compounded annually, needed to account for such a change. Such a rate of inflation each year is hardly galloping. In fact, it is likely that the long-range relationship between stock and bond prices reflects the expectation of some type of annual inflation, and that further allowance is appropriate only if a faster steady rate is deemed reasonably certain.

IS PROGRESSIVE INFLATION LIKELY?

The argument that a progressive inflation is inevitable ascribes its certainty to the strength of labor unions and their insistence on obtaining wage advances exceeding the increase in labor's productivity. In the face of these demands, there is an unwillingness to accept the cost and risk of long strikes. Only when serious overproduction or active competition among different industries exists, or where labor is poorly organized, plentiful and immobile, is there much incentive for management seriously to oppose wage rises which exceed the increased output per worker.

The Government likewise walks gingerly in the precincts of this cause of inflation. Pious exhortations to keep all costs low are lavished indiscriminately on capital and labor. Hans Apel, of Bridgeport University, astutely points out that these Governmental pleas are for action contrary to the fundamental tenets of the capitalist system. Classically, it is up to the fiscal authorities of the Government by monetary policy to reduce the inflated demand for goods and to induce increased savings so that supply matches demand at uninflated prices. If the cost of living fell, or remained stable, labor's demands would supposedly be more reasonable. Whether the degree of transitory less-than-full employment involved would, in our democracy, force a change in Government anti-inflation policy is a chimera frightening to Republicans and Democrats alike. Voters, when the chips are down, are likely to prefer inflation of their savings to even transitory less-than-full employment.

The supposedly independent Federal Reserve Board is sensitive to these pressures. An important study by the National Bureau of Economic Research of instalment credit which the Board instituted concluded with a symposium of outstanding economists. More than three-quarters of them favored some form of flexible control, yet the FRB decided none was needed. Canada has successfully imposed indirect controls on instalment finance companies, without arousing a public outcry. The Board in November lowered the discount rate before consumers' prices had reversed their long upward trend.

Our Government has lectured other countries on their need to fight inflation but has been fairly hesitant to take effective and timely action itself. We must conclude that a creeping inflation is not unlikely, perhaps 1% more per year than has been historically the case. It behooves the investor to estimate how to allow for such inflation in valuing the relative rewards of lending to business enterprise as compared with sharing its ownership—the relative value of owning bonds instead of stocks.

EFFECT OF INFLATION ON BONDS, NEGLECTING TAXES

The individual investor pays income tax on dividends and interest, but with a recent tax advantage for the former. In addition, retained corporate earnings are not taxed to him immediately, and they are finally taxed, if at all, at the lower capital gains rates. It is difficult to estimate the impact of income taxes on stock and bond prices. Bonds are owned in higher concentration by tax-sheltered entities than are stocks. Still, the individual investor cannot be blind to the tax advantages of stock ownership. At first, in our analysis of the effect of inflation on security prices, we shall neglect tax considerations but finally we shall allow for them.

Clearly, if 1% of the purchasing value of the capital lent is lost by inflation each year, the lender will insist on obtaining enough extra interest to offset this loss. Thus, in middle November, in the week before the decline in the FRB discount rate, Standard & Poor's Index of A1+ Corporate Bond Yields was 4.17%. For a 1% annual steady inflation, the effective yield would be 3.17%, the other 1% being added to capital to maintain its buying power.

EFFECT OF INFLATION ON STOCKS, NEGLECTING TAXES

Unfortunately, the evaluation of equity investments is not so simple. As George Terborgh has shown, the net worth of a business during an inflationary period is undervalued by our present methods of accounting which depend on actual cost. The depreciated book value of the fixed assets is less than their actual market value. On the other

side, the depreciation reserve is inadequate to finance their replacement. This means that profits are seriously overstated, since they must be drawn on in good part to augment the inadequate depreciation reserve. And corporate income taxes have to be paid on this spurious "profit," since it is not recognized as an expense.

These are complicated matters with which to deal. Instead, consider a new business starting during a creeping 1% annual inflation. Aside from the usual depreciation, one would properly have to set aside each year an extra 1% of depreciated assets from after-tax retained earnings to offset the inflationary loss of value of the equity investment. With the Standard & Poor's Industrials yielding, in mid-November 1957, about 8.68% in earnings (not dividends), the adjustment would reduce the earnings yield to 7.68%, a low figure historically but so far without regard to income taxes. It is not immediately evident, after the autumnal decline in the 1957 stock market, whether the investor is still over-valuing earnings, possibly in the belief that inflation is automatically hedged by an equity investment. Only where very little of net worth is invested in slowly depreciating assets requiring replacement would the purchasing power of an equity investment seem to be proof against inflation. If the life of the asset is short, or if, as in mining, it is not replaced, inflation might seem by itself to be of small consequence. However, increasing efficiency of discovery, mining, transportation, and utilization, as well as newly competitive products, may militate against equities in mining as a hedge during slow inflation.

EFFECT OF INFLATION ON EQUITY

Where capital is partly borrowed, the effect of inflation on the equity is more complicated. Debt, being repayable at a fixed dollar amount irrespective of intercurrent inflation, requires no extra reserve for repayment because of inflation: the lender's inflation protection and borrower's inflation cost have been provided under the terms of the loan which set an appropriately higher interest rate. The equity, which has bought only part of the depreciating assets, must still provide an inflation offset from after-tax earnings so that it can replace its part of these assets at the higher prices expected in the future. When these higher prices are paid, the debt-equity ratio being maintained, extra money will be borrowed for that purpose.

We then conclude that most equities, irrespective of borrowed supplementary capital, are subject to the impact of inflation. Earnings should be reduced by 1% of the value of the invested equity capital each year for a 1% annual continuing inflation.

It should be noted that this statement, while true, glosses over the relative effect of inflation on leveraged as compared to non-leveraged equity. The inflated cost of borrowing money is partly alleviated for the leveraged company because interest paid is an expense in figuring income tax. In addition, the earnings of the leveraged company are higher, because of the risk incurred in borrowing, than that of the non-leveraged company. The 1% of equity needed to be reserved annually from net earnings to counterbalance a 1% creeping inflation represents 10% of earnings for a 10% earnings yield, but only 5.1% of earnings where, because of leverage, the yield is 18½%.* This difference in inflation susceptibility caused by leverage can be borne in mind in evaluating a single common stock, but the method we here propose, an annual deduction of 1% of the equity from its earnings for 1% creeping inflation, is unaffected by the presence of borrowed capital.

Our before-tax estimate of equity susceptibility to creeping inflation assumes that all of the assets of the business are depreciating and becomes necessary because accountancy and income taxation neglect any extra depreciation allowance for creeping inflation. If a sizeable portion of the assets are non-depreciating, the inflation allowance should be proportionately reduced. Thus, if as much as 25% of assets are non-depreciating, the annual allowance should be 0.75% of the equity for each 1% of creeping inflation. The final formulas derived for inflation offset based on no depreciating assets (see formulas (1) and (3) below) would be modified by an average of 25% non-depreciating assets by substituting 1.1% inflation for each 1.0% actual annual creeping inflation. The result of this substitution would be to augment by 10% the swings in the predicted stock indices arising from change in the expectation of inflation for a given level of bond yields. We shall assume here that *all* assets are depreciating, leaving to the reader any further adjustment he feels warranted. It is likely that considerably more than 75% of assets are wasting so that our working assumption is acceptable.

Over the last 10 calendar years, the Standard & Poor's Industrials have sold at an average earnings yield of 11.1%. Thus, our 1% correction would reduce it to 10.1%; a 9% reduction of stock earnings should be applied to recognize the impact of the 1% yearly inflation. Dividends in this decade were 51% of earnings, and it is unlikely this ratio would change with inflation. We then estimate that an average 4.6% reduction in effective dividend yields for a 1% inflation each year is needed for revaluing stocks. High grade bond yields for the same period are, instead, reduced from 2.89% to 1.89%, a reduction of 35% for the same amount of inflation. Stocks, though not unaffected, are seen to be more inflation resistant than bonds.

It is sounder not to use averages of stock earnings but, instead, to apply the inflation correction to the dividend yields themselves. From the index of stock dividend yield we subtract 0.5% (51% of 1%), the other 0.5% coming from retained earnings; from the index of bond yields we subtract 1% for a yearly 1% creeping inflation. Of course, these estimates are still uncorrected for income tax.

ADJUSTMENT OF YIELDS FOR TAXES

Allowing for an effective over-all income tax bracket of 40%, the individual bondholder, if he would save 1% of capital from interest *after* taxes, would need to save about 1.7% of capital to be deducted from interest *before* taxes.

The computation for dividends is complicated by the fact that taxes on the capital gains of retained earnings are lower

*The example assumes a 50% debt at 5% interest under 1% creeping inflation instead of 4% without inflation. According to the data of George Terborgh previously referred to, about 21% of capitalization is debt.

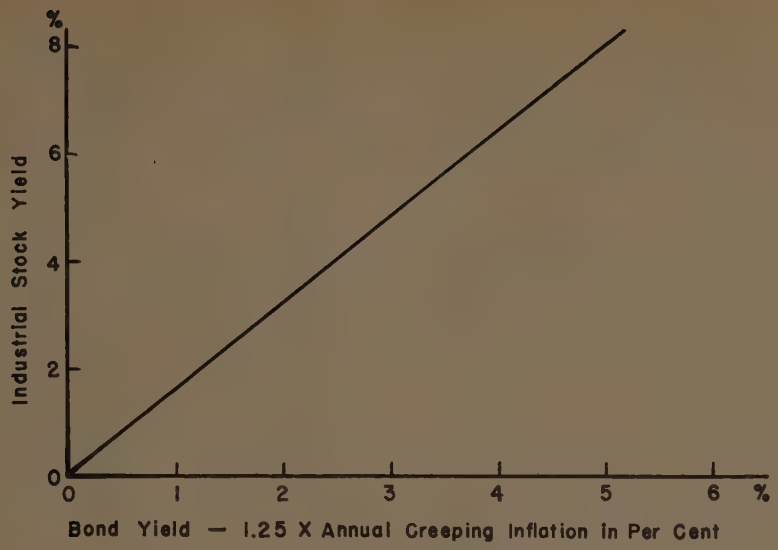


Fig. 1. The relationship between Standard & Poor's Industrials dividend yield and High Grade Bond Yield after adjustment is made for expectation of a continuing, creeping annual inflation. An inherent ratio of inflation-adjusted stock yields to bond yields is assumed.

than on dividends and that for each 51c of dividends set aside for the 1% inflation, a corresponding 49c of retained earnings are also considered sequestered for the same purpose. This is so because "true" pay-out ratio of earnings after inflation adjustment is to be kept at the 51% of the actual pay-out ratio during 1947-1956. The result of the calculation is that 0.7% of capital needs to be deducted from the dividend yield before income taxes to offset the 1% inflation. With the special 4% dividend tax credit, the average investor keeps 64% of the 0.7%, or 0.45%. The retained earnings left in the company which are also regarded as sequestered amount to 49/51 of 0.7% of capital or 0.67%. Allowing for an over-all effective capital gains tax of 18%, the net amount of retained profit which is held for helping to restore the inflationary loss is 82% of 0.67%, or 0.55%. Together, the two after-tax sequestered amounts, 0.45% and 0.55%, add up to the required 1%.

In summary, then, inflation can be allowed for in bond yields, assuming a 40% effective income tax, by reducing the indicated yield by 1.7% for each 1% of annual creeping inflation. For stocks, the indicated dividend yield for the same effective income tax needs to be reduced by 0.7% for each 1% of inflation. Clearly, as expected, stocks are more resistant than bonds to the impact of inflation but are not a complete defense against inflation.

There is a rough correlation between stock and bond yields over the years; other factors, such as fear of inflation or deflation, varying income taxes, the economic cycle, politics are influential. Still, since we are considering the effect of inflation on the value of securities, we are particularly interested in the relative effect of inflation on the two types of investment, loan and ownership. The analysis here undertaken indicates how, on rational grounds, the stock yield to bond yield ratio may be expected to shift with the prospect of creeping inflation. This factor alone might well explain much of the historic deviations of this ratio of yields from its long-term average.

During the past 28 years, the ratio of the yields of Standard & Poor's Industrials and High Grade Bonds has averaged 1.71. We shall assume that this long-term ratio is basic for the investor, when account is taken of the special 4% income tax advantage of dividends over interest and when the yields are adjusted for the impact of expected creeping inflation.

The 4% dividend credit for an income tax bracket of 40% increases the spendable dividend by one fifteenth. Applied to the 1.71 ratio, the dividend advantage should work to reduce this ratio to 1.60—the value we shall use in our appraisal of stock and bond prices in the light of inflation.[1]

All that remains now is to write the proposed relationship between adjusted stock and bond yields, where F represents the annual inflation rate in per cent:

$$\text{Stock Yield} - 0.7F = 1.6\ (\text{Bond Yield} - 1.7F)$$

This expression can be recast in various, more convenient forms:

(1) $\text{Stock Yield} = 1.6 \times \text{Bond Yield} - 2F = 1.6\ (\text{Bond Yield} - 1.25F)$

(2) $F = 0.5\ (1.6 \times \text{Bond Yield} - \text{Stock Yield})$

(3) $\text{Stock Yield} / \text{Bond Yield} = 1.6 - 2F/\text{Bond Yield}$

The dependence of the three variables on one another is seen in graphic form in Fig. 1, derived from formula (1).

The suggested dependence of the stock yield: bond yield ratio is indicated in formula (3).

1. A secondary distortion of the dividend pay-out ratio from earnings is neglected as being minor.

APPLICATION OF THE FORMULAS

We can now estimate the expected effect of various levels of anticipated creeping inflation on stock prices under today's level of interest cost; or, instead, the degree of creeping inflation the market is anticipating under some particular set of circumstances, applying the appropriate one of the above formulas.

Using the week ending November 13 figure of 4.17% for the yield on Standard & Poor's High Grade Bonds, and 4.57% for the corresponding yield of the Industrials at 42.51, we find F = 1.05%. If our premises are justified and investors are actually reacting to the prospect of a continuing creeping inflation, they should be anticipating one of about 1% a year above the long term basic one of perhaps 0.65% or 1.7% altogether.

With no inflation, the formula suggests a fall of the Index from 42.51 to 29.13, a decline of 34%. This points up how importantly the prospect of creeping inflation should influence the investor's judgment of the value of stocks. For the same bond interest rate and stock dividends, the average investor who expects 1% inflation a year would reasonably pay 46% more for stocks than the one who expects no inflation.

Of course, it may be argued (there is ample room for argument in view of the series of assumptions which have been made) that investors regard present bond yields as unduly high for a temporary period. In that case, note that a decrease in bond yield of 0.75% to 3.42%, a level still higher than it has averaged in any year from 1936 to 1956, but assuming *no* extra creeping inflation, indicates an Industrials Index of 35.51, only 16% below mid-November. With 1% extra progressive inflation added, the formula raises the Index to 55.96. These results, which can provide fodder for bull or bear alike, are summarized in the table below:

Annual Inflation %	S & P High Grade Bond Yield %	S & P Industrials
0	4.17 (Nov.)	29.13
1	4.17	42.51 (Nov.)
0	3.42	35.51
1	3.42	55.96

CONCLUSION

Our conclusion from this appraisal is that fear of inflation on a steady, continuing basis which seems not unlikely, justifies the current (July) level of the stock market, if interest rates, earnings and dividends are maintained. On the other hand, should interest rates decline only moderately to a level still above their long-term range, the current price of stocks becomes low if the expectation of a 1% annual creeping inflation above the fundamental historic one is being widely discounted. Without the anticipation of continuing progressive inflation, or with the expectation of a falling off in earnings and dividends, stocks seem overpriced.

As investor opinion varies on the probability of continuing inflation, marked swings in stock market prices are to be expected. And such swings themselves affect investor opinion: rising prices breed presumption of inflation; declining prices feed belief in deflation.

In any event, where so many other intangible forces play on the stock market and affect its level, we cannot presume to predict its course. All we have sought to do here is to show that the effects of inflation on security valuation are not incalculable and that fluctuations in the fear of continuing inflation may well cause wide stock market gyrations.

An Approximate Formula for the Yield on Bonds Selling Close to Par

ROGER R. BALDWIN

MOST BONDS MAKE a constant-size, semi-annual interest payment and may be redeemed at face value on their maturity date or sold prior to maturity at a market price. The market price is almost never exactly equal to the face value, and, consequently, "yield to maturity" must reflect both the interest payments and the difference between price and face value. Yield to maturity is defined as the interest rate (compounded semi-annually) at which investment of the purchase price of the bond could obtain a return equivalent to the bond's, i.e., a return enabling the investment to make the same semi-annual payments as the bond and still have exactly the bond's face value remaining at the maturity date.

Usually, one knows face value, interest payment, maturity date, and price, and wishes to calculate yield to maturity. Unfortunately, the standard "bond formula" expresses price as a function of the other four variables and cannot be manipulated to obtain an explicit expression for yield. While numerical tables[1] based on the bond formula give the yield associated with relevant combinations of the other four variables, these tables are not useful for insight into the relations between the variables. For this reason it is desirable to obtain a simple, explicit formula for yield. While the simple formula can be only an approximation, it will be reasonably accurate for bonds selling close to par.

STATEMENT OF THE APPROXIMATE FORMULA

Let i be the yield to maturity of a bond with market price M, par value F, coupon rate r (each semi-annual interest payment is ½rF), and maturity date T years in the future. The approximate formula for yield to maturity is

$$i = r + (1 - M/F)\ (1/T + .6\,r)$$

In the above formula i and r are expressed as decimal fractions, not as percentages.

To illustrate the use of the formula let us consider the case of the World Bank 4¼'s May 1 '78 priced at 95 on 25 October 1957. M=95, F=100, r=.0425, T=20½.

$$i = .0425 + \{\,1 - (95)/(100)\,\}\,\{\,1/(20\tfrac{1}{2}) + (.6)\ (.0425)\,\}$$
$$i = .0425 + (.05)\ (.049 + .025) = .0425 + .0037$$
$$i = .0462$$

Thus according to the approximate formula the World Bank bonds yielded 4.62%. This figure agrees well with the actual 4.63% yield obtained from a bond table.

Historically, bond yields have almost always exceeded 2%. Consequently it is reasonable to require that the maximum error in the yield to maturity given by the approximate formula be 1/20% (5 basis points), or at most one part in forty. Extensive computations show that this accuracy will *always* be attained when the following conditions hold *simultaneously.*

(A) The coupon rate is 6% or less.

(B) The maturity date is at least 5 years but not more than 33 1/3 years in the future. (If the coupon rate does not exceed 4%, maturity dates up to 50 years hence are allowable.)

(C) The market price is between 94 and 106.

The error in the approximate formula tends to increase with the coupon rate and the difference between market price and face value. The error also tends to be greater for very short and very long maturity dates. While the error in the approximate formula may be less than 1/20% (5 basis points) even when some of the conditions do not hold, such accuracy cannot be guaranteed.

Condition (C) above limits the practical value of the approximate formula. For example, only about one-fifth of the domestic bonds traded on the New York Stock Exchange in the week ending 25 October 1957 satisfied all three conditions. However, all these bonds satisfied condition (A) and about 90% satisfied condition (B).

While one-fifth is not a very high fraction, the practical value of the approximate formula improves in special situations. All United States Treasury bonds now on the market, for example, have coupon rates not exceeding 4%. The approximate formula could be applied to these bonds over a wider range of prices than in condition (C) without making errors of 1/20% or more. Similarly, new issues almost always satisfy the three conditions.

When the accuracy desired for yield to maturity is greater than 1/20%, or the three conditions are not satisfied, the approximate formula is still useful as a rough check on values obtained from a bond table.

The approximate formula also is useful when two similar prices are quoted for the same bond, and one wishes to find the corresponding difference in yields. The two prices might be competitive bids, a bid and asked price, or prices on successive days. The following simple, approximate expression for the difference in yields is derived easily from the approximate formula.

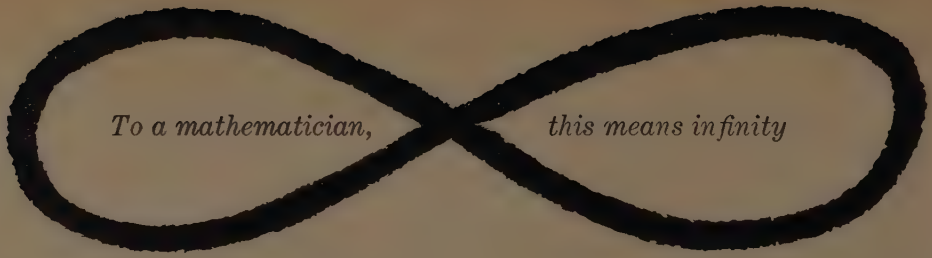
$$i_1 - i_2 = \frac{M_2 - M_1}{F}\ (1/T + .6\,r)$$

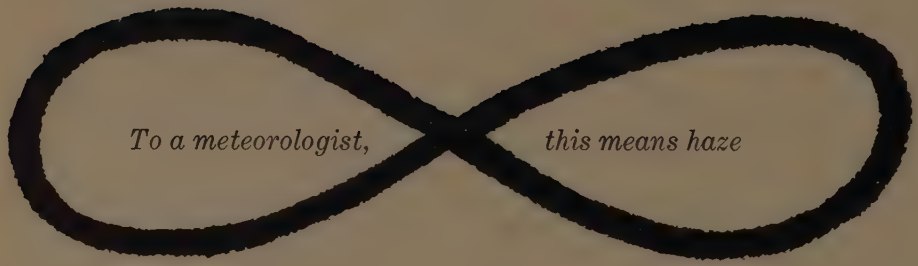
To illustrate the application of this expression, let us suppose that the price of the World Bank 4¼'s May 1 '78 rises from 95 to 96. M_2=96, M_1=95, F=100, T=20½, and r=.0425.

$$i_1 - i_2 = (.01)\ (.074) = .00074$$

Thus the drop in yield is .074% or 7.4 basis points.

1. Comprehensive Bond Values Tables, Boston, Financial Publishing Company, 1953.





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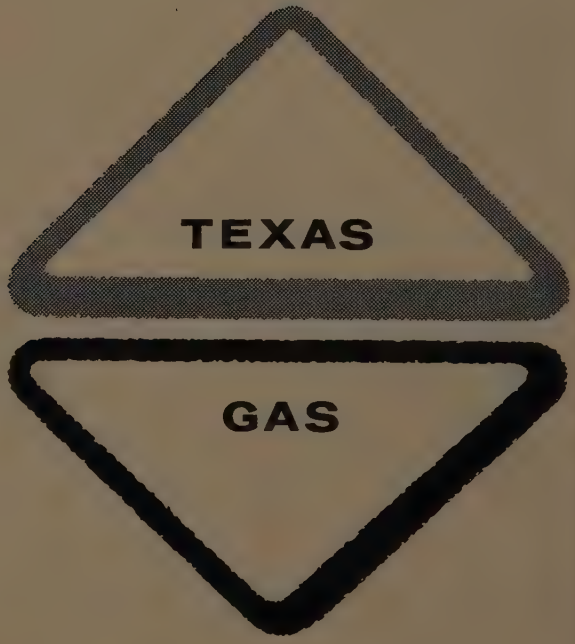

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SERVING THE BIG RIVER REGION

A Look at the Computer Industry*

NED CHAPIN

MOST OF MY TIME in recent years has been spent in close association with the use of automatic computers in business data processing operations. From this work I am acquainted with the data processing problems of business, with the computers available, and with the problems facing the firms in the computer industry.

From this point of view, I would like to talk with you about the automatic computer industry in terms of its investment features. In doing this, there are several subjects I will not cover. In the first place, my remarks generally will be confined to a consideration of the industry as a whole and not to the individual firms that comprise the industry. From time to time I may comment about some features that may characterize different firms, but in each case I shall attempt to do it in a way that reflects industry features.

Also, because of time limitations, I will not discuss the probable future prices of the various security issues, either debt or equity, that may be outstanding or may be issued by any firm in the computer industry. A related topic that I will not discuss is the subject of expected dividends and interest yields on the various security issues that may be outstanding or may be issued by firms in the computer industry. This is a subject closely related to the first, and to treat it well would require dealing with the first topic. This does not suggest that it is not important; on the contrary, it is of vital concern to anyone seriously contemplating investment in the computer industry.

The subjects that I should like to discuss with you are also vital, for they are the subjects of earnings and the need for capital. Let us consider earnings first. In the extended absence of earnings, nearly any investment and many a speculation may prove sour.[1] Conversely, the presence of high and stable earnings considerably enhances the worth of an investment. I would like to discuss earnings in two distinct parts, because earnings result from two other factors, sales and costs. When sales are high and costs are low, earnings tend to be large. Conversely, earnings are small or negative where costs tend to approach or exceed the sales available.

SALES

Let us turn our attention now to the subject of sales in the computer industry. One of the most attractive features of the industry has been its sales record. The industry is young; automatic computers themselves are scarcely ten years old, and the commercial availability of computers dates only from the early 1950's. For example, the growth in sales of the computer industry since 1954 can perhaps best be illustrated by the terms in which it has been described. In 1954 it was in terms of a few million dollars. In 1957 the sales of the computer industry were described in terms of a few hundred million dollars.

This very sharp growth in sales has attracted the attention of investors and speculators. It is common knowledge that the manufacturers in the computer industry themselves have been more than surprised by the volume of sales achieved by the industry in such a short time. Manufacturers' production schedules on some computers for which ready market acceptance has been achieved have been increased and extended, not once but two and three times.

Most financial analysts are acquainted with the publicly distributed study made in 1956 for White, Weld and Company. This study, entitled "Electronic Data Processing Industry: Present Equipment, Technological Trends, and Potential Market," indicated at that time a maximum potential market for automatic computers that even now, about two years later, appears obviously too low. It is significant that the best estimates that could be made as short a time as two years ago should now appear, even in this time of recession, to have been so far short of the mark.

More recent studies of the computer industry market may in the future also appear unrealistically low, or they may appear high. Hindsight is much more accurate than foresight, as every analyst knows. But the point remains that the growth of the market for computers has been a source of wonderment not only to investors, speculators, and financial analysts, but also to the persons in the industry and to independent observers.

What about the future sales of the computer industry? Will the rate of growth that has been recorded to date be continued, or will there be sharp changes? And what about the effect of the recession?

In general, I expect the future sales of the computer industry to show an upward trend. I would be surprised if sales in any future year should drop back to as "low" a level as that of the industry during 1957. The absolute rate of growth in these sales, I expect, will be variable. Some of the probable reasons for this variation are worth examining. First, the industry's sales will depend partly upon the particular models of computers that are offered and the degree to which they are promoted. Heavy marketing effort on good equipment should result in higher sales. It is impossible to estimate at present what the extent of the marketing effort and the specific characteristics of future equipment will be five or ten or fifteen years from now.

Also, I expect that some variation in the sales of the computer industry will arise from temporary economic conditions. Thus the present recession has, in my observation, somewhat impaired computer sales, but this impair-

1. The implied distinction here between investment and speculation is deliberate.

*This paper was delivered at the Eleventh Annual Convention of the National Federation of Financial Analysts Societies. It was received too late for the Proceedings, but because of its great worth is included in the August issue.

ment will not show up immediately in terms of the revenue received by the companies in the computer industry. On the contrary, it will be gradually spread over about a year and a half. This spreading effect arises because some users of computers are postponing acquisitions, and others who were about to begin preliminary investigations are postponing making those.

As to the effect upon the computer industry of a more severe recession than the present one, or perhaps even of an extended depression, I think a distinction should be raised. A recession that is expected to be of temporary duration I feel would impair the growth in the sales of the computer industry. The more severe the recession, as long as it was expected to be temporary, the greater would be the impact upon the computer industry.

However, I suspect that a decline in the national economy which was expected to be of long duration would not seriously affect the sales of the computer industry. If a prolonged economic downturn were anticipated, I would expect business management to search for ways to cut costs and to improve management control. I would expect this to help to maintain sales of the computer industry, but not to expand them. Some prospective customer companies would drop out of the market because of changes in the level of their operations. In short, as to the absolute rate of growth of sales in the computer industry, I would expect the sales to be variable, but probably with an over-all upward trend for the near-term future.

A matter of interest is the distribution of sales among companies in the computer industry. Three main factors will tend to determine this distribution: the marketing effort, the technical support, and the equipment specifications. Let us consider these briefly.

THE MARKET EFFORT

The most significant factor will probably be the marketing effort. The effectiveness of the marketing efforts of the various computer manufacturers depends upon several things—the quality of the personnel in the field, the quantity of these personnel, the expertness of the direction and guidance they receive from their supervisors, and, most important, their ability to impress prospective customers that they are competent to give assistance of satisfactory quality and quantity.

The marketing of automatic computers differs from the marketing of most other types of industrial equipment. The typical user of a computer leans heavily, at least initially, upon the services of the computer manufacturers' sales force. It is my observation that many a sale has been won or lost on the basis of the support that was promised and later delivered by the computer manufacturers' sales representatives. It is not that potential users of computers are incapable of directing their own utilization of the machines, but when, on a competitive basis, various manufacturers offer to assist and to advise prospective customers in the use of computers, why turn down what should be free and expert service based upon more experience with more installations than the prospective customers themselves could draw upon?

It seems to most persons outside the field that this matter of marketing effectiveness should not be very significant—that if the capabilities of computers were fully explained to the potential user, along with the usual price, installation, and maintenance data, it would seem to be a clear-cut matter of weighing benefits against costs, both operating and investment. Unfortunately, the nature of the automatic computer makes this view not fully accurate. Because automatic computers process only information and because this processing is complex and not widely understood, potential users tend to rely on the computer manufacturers for guidance. This is provided as part of the marketing effort of the firms in the computer industry, which in turn has a major effect upon their relative market positions.

A second factor, closely related to the first, is the technical support supplied by computer manufacturers to their sales organizations and to their customers. The technical support activities consist of supplying booklets, brochures, routines, condensations of the experience of other companies, and other aids in using computers more effectively. It also involves the services of mathematical analysts, who assist and consult with customers and potential customers on aspects of proposed uses of the computers, or even suggest more refined and advanced uses. There is also a tendency to emphasize "technical" support because it is more palatable to customers and prospective customers than what is without question "sales" effort.

A third factor, and I think it is definitely in third place, is the matter of equipment specifications or capabilities. It is my observation that the actual specifications of the equipment—the factors that really determine how capably it will perform in data processing operations for a prospective customer—are much less important than the amount of marketing effort and technical support brought to bear by the computer manufacturer in swinging a sale.

Only the more sophisticated clients who feel that they are competent to evaluate and use automatic computers adequately tend to weight equipment specifications heavily. It is my observation that those who are relatively unsophisticated and who tend to lean on computer manufacturers for guidance and support generally find that the equipment specifications are of secondary significance to them. A poor machine, well used, may be for them much more satisfactory than a good machine poorly used. Therefore, in the computer industry, competition based upon equipment specifications will probably be less important, as it has been in the past, than competition based upon marketing effectiveness and the degree of technical support supplied by computer manufacturers.

This is not to suggest, however, that the specifications of the equipment are irrelevant or unimportant. Because the computer manufacturers themselves are sophisticated and because they feel some sense of integrity in the sales statements they make, the existence of very capable equipment for a given price has an important influence upon the marketing work that is done. It is certainly true that it is easier to speak convincingly with prospective customers about good equipment. To this extent, at least, equipment specifications and capabilities are factors in the distribution of sales among computer manufacturers.

Another aspect is worthy of note. It has been suggested

that some computer manufacturers attempt to "buy their way" into the market by offering a particular model of computer with a given capability level at a price considerably lower than other manufacturers are asking for roughly equivalent computers. This obviously is a significant competitive pressure, because sales to those prospective customers who better understand the capabilities of the various computers will undoubtedly be lost unless prices are at least approximately met by the competition.

Sharp disparities between comparative equipment capabilities and prices generally receive considerable attention among the officers of prospective customers companies in private conversation with others who have used computers or who work closely with them. The presence, therefore, of capable equipment, priced to sell, even in the absence of strong marketing effort and strong technical support, has the effect of pulling down the prices that can be obtained.

This price-leveling action has a significant effect upon the earnings performance of other companies in the field. It may increase the sales of the company that offered the equipment at a price lower than expected, but in order to stay in the market other computer manufacturers in turn must set prices on their equipment taking into account the prices charged by the competition. Since most costs of a computer manufacturer are overhead costs and relatively fixed, the temptation to try for volume by offering a low price is present. This is not to say that computer manufacturers generally reduce their prices. On the contrary, the historical record is clear that the trend is to increase prices, but this trend, in my opinion, reflects mostly the fact that the companies that have attempted to "buy their way" into the market have not realized the volume they hoped for and, in order to survive, had to raise their prices. Part of the trend, of course, can be attributed to the inflation that has occurred in the past five years.

COSTS

I would like to return to the subject of sales at a later point, but, since we already have raised the question of cost, let us turn our attention now to the costs that appear to be characteristic in the computer industry.

One of the most significant factors in the history of the computer industry is that the costs of computer manufacture and distribution have been high. In relation to sales, costs have been so high that earnings frequently have been negative. In the light of this, let us consider briefly some factors that will affect the costs of the computer industry in the coming years.

A cost factor that is of major significance in the computer industry is the cost of providing the marketing effort needed to survive. Selling automatic computers is an operation that requires a very heavy investment in terms of man-hours in order to achieve a sale. The situation is not like selling brushes from door to door. In that case, if one rings enough doorbells of people who are home during a week, one can expect in the long run to turn a certain percent of those calls into sales on the spot. To increase sales, one thing to do when selling brushes is to increase the number of doorbells pushed.

Marketing computers is somewhat different, however. Pushing doorbells is still an important aspect, but it is not nearly as important as regular, repeated visits to the same prospective customers. To market a computer, it is necessary first of all to locate those persons in the organization who are charged with the responsibility for investigating and evaluating improved data processing alternatives. It is also necessary to get the ear of the person who holds the purse strings. Once harmonious relations have been established with both, it is necessary for the computer-marketing personnel to introduce the idea of using a computer in general and this individual manufacturer's computer in particular. This typically involves making very extensive studies of the particular prospect's data processing operations. Only as this investigation is carried to the point where it appears that a cost saving can be realized by using an automatic computer is the computer sales representative in a position to begin to really make an effort to close the sale

The magnitude of the operations just briefly listed is not something that is done in a matter of 20 minutes or even 20 working days. The typical investment in manpower for customers who do turn into sales is typically measured in man-years that involve the services not of one man but a group of several spread over the course of one or two years of time. Then there is also the "sale that got away." The same amount of effort must be placed upon all customers who appear to be worth the investment of time and work and until such time as a definite decision is obtained from them for or against the use of the computer the manufacturer's sales representative is pushing. This, obviously, is also an expensive operation, because not every prospect the sales force works on will eventually acquire that computer manufacturer's offering.

But the cost does not stop there. Once a customer has agreed to purchase or lease a computer, it is then necessary, at least because of the pressure of competition, for the computer manufacturer to supply several man-year's worth of personnel to assist the customer to prepare for the use of the computer he has agreed to acquire. This too is an expensive operation, even though it is more concentrated on particular companies than the general marketing effort. If one manufacturer promises to assign eight men for one year to assist the prospective customer in preparing his applications and another computer manufacturer offers to assign five men for one year and if everything else is about equal —the customer obviously will take the additional manpower because it cuts down his own investment in manpower.

It also should be pointed out that during the marketing effort, considerable stress is placed upon the use of technical support supplied by mathematicians, statisticians, installation engineers, representatives who have specialized in the problems of particular industries, etc. There is, in addition, a certain amount of visiting by executives and minor officials of the computer manufacturers' staff to keep the prospective customer impressed with the alertness, depth, and quality of service and the strong support supplied by this particular computer producer. These operations, needless to say, are costly.

But the costs of sales effort do not stop here. In addition,

there is the expense of training the customers' personnel and of periodic retraining of the marketing staff of the computer company. In other words, because equipment becomes technologically obsolete and because the persons assigned by the company that acquires a computer typically have no experience in this field, it is necessary on a competitive basis alone, if for no other reason, that a computer manufacturer supply training, usually free of charge, to the customer's personnel and to his own personnel on the attributes and use of the particular computers available. This involves classroom operations as well as individual consultation on particular problems faced by the sales representatives and by the prospective customers. This operation, because it is done with groups of people, does not seem as expensive as the marketing effort discussed previously. Nevertheless, there is a substantial expenditure involved in maintaining this training operation.

Another major cost for the computer industry is the design of new computers. Actually, a computer is an aggregation of many different types of equipment. It is not as simple to design a computer as it is to design, say, a typewriter or a desk calculator. The order of magnitude of the design problems is higher in the case of the computer. Because of advances in the components from which computers can be constructed and because of the fact that these new components have characteristics which are quite different from those that have been available, much fundamental rethinking of basic design must be done to incorporate new components. In addition, manufacturers frequently wish to change the specifications and capabilities of the computers they offer. This places a twofold problem on the design engineer in the computer industry. He must design not only to utilize the components available but also to meet the specifications established for the equipment in question.

This type of design work proceeds slowly, first from a logical type of analysis to complex charts, diagrams, and circuit plans. This, again, is an operation whose magnitude is probably best measured in terms of man-years. And computer design is not a static thing because of the pressure of competition. For these reasons, there is considerable pressure upon design engineers to improve or upgrade the performance obtainable from the computers being designed.

Another major cost for computer companies comes after the design of the equipment has been worked out; it is product development. Product development must take the design that has been prepared, construct the prototypes, test them, and revise the design on the basis of results of the construction and testing. Product development in the computer industry is inherently costly because the equipment is complex and because, in the process of development, a computer sometimes will be dropped from the product line or thoroughly redesigned before being subjected to further development.

This raises questions about the degree of obsolescence[2] that is observed for the computers produced by the industry. In the last seven or eight years, the capabilities of automatic computers commercially available have improved by a factor of about ten each year for some one or other of the important capabilities. This is a high rate of technological advance. It is clear from data available on new components and on the intentions of computer manufacturers that the rate of change in the performance of computers will continue for quite a few years about the same as in the past.

The motive for this rapid change in the capabilities of computers appears to be primarily the desire to capture sales by offering the most modern and advanced equipment available. This drives each company in the industry to compete with the other companies in terms of capabilities of the equipment. This, in turn, leads to planned obsolescence and to deliberate action on the part of firms in the industry to make their own and competitors' products obsolete by offering a stream of improved products. Each improvement makes all products of competitors appear less desirable to prospective customers.

CAPITAL NEED

Before taking up the topic of sales again, let me review the implications of the previous discussion in terms of capital need in the computer industry. From the information available on sales it appears that the cash inflow from sales for the industry will be increasing. But all the cash inflow will not materialize at the time a computer is delivered, because a number of installations will be on a lease, not purchase, basis. Also, the prices at which the sales are made will be held down by the competitive factor of the availability of improved computers at what appear to be lower relative prices offered by some firms.

On the cost side, it should be noted that costs of designing and doing product development of a computer must be paid before any sales are made. In addition, nearly all the marketing effort, technical support, and customer training take place before delivery of a computer to a customer. This means, in effect, that nearly all of expenses except maintenance are incurred before any revenue is received and the revenue that does come in may be received in the form of a series of periodic future installments.

On top of this, it appears that, because of competition, management in the industry will have a difficult time keeping costs to within at least hailing distance of its nominal revenue from sales. In short, retained earnings are likely to provide little capital for the computer industry. Leasing of computers will require capital. And capital will be needed simply to support the increasing volume of sales and the increasing amount of production that will be necessary to meet delivery schedules, and to field an effective marketing force. All these factors indicate a need for large amounts of new capital.

It can quite properly be asked whether or not any companies in the computer industry will be exempt from this need. It is possible that there may be occasionally a company which designs, develops, markets, and produces a large amount of one particular model of computer for which the volume of sales can be pushed high enough to amortize in full the costs of design, development, training, etc. Here some earnings will be made, but my observation suggests this will be the exception and not the rule.

2. Note that the obsolescence being discussed is not economic obsolescence, but obsolescence in the sense of change, whether or not economically significant. This is the way the term is commonly used by sales representatives in the industry.

These considerations suggest that the capital needed for the computer industry must be forthcoming largely from sources other than earnings arising from the production and marketing of computers. One such source is the earnings of allied or associated product lines. For example, if a computer manufacturer were also in the auto parts business, there might be enough earnings from the auto parts operations to finance, in part, the capital need of the computer operations.

It is my observation, however, that the earnings of allied lines will in general be inadequate in most firms to bear the cost of the computer operations. This suggests the need to tap outside sources of capital, either on a debt or equity basis. For survival, I expect that some firms in the industry will in the forthcoming years be forced to draw upon the general capital markets for funds. Other firms will be forced into merger, into developing allied lines, and into dropping out of the industry.

BASIC USE RESEARCH

The discussion so far has led us from sales to costs to capital need and now back to sales again. From my observation, I feel that the market saturation level for automatic computers depends in part upon the prices and capabilities of the equipment the industry offers to potential customers. But it also depends in part upon the value that users can obtain from the computers. Let us illustrate this with a comparison. An observer of the computer industry might be tempted to ask in what ways is the acquisition and use of an automatic computer by a business firm different from the acquisition and use of any other piece of large and complex industrial equipment. There are two major differences: what is expected and how to obtain what is expected.

In the case of an automatic computer, the operation performed by the machine is not the common transformation of raw materials into physical products (like a lathe) but is the transformation of information into still other information. There is a stable, definite, and concrete quality to the transformation of raw materials into products, but there is something slippery, complicated, and subtle about the transformation of information into still other information.

An automatic computer is a tool to assist the mind, not a tool to assist the physical labors of men directly. It does not transform physical things into forms which are useful as physical things; rather it is a machine that transforms information in order to enable better decisions on the part of management. Automatic computers perform operations that are of an inherently different character than is the case for other large, complex industrial equipment.

This means that what is expected of an automatic computer is inherently different also. The manipulation of symbols that represent conceptions, facts, and beliefs in a way that is useful to business management is what management expects. But this is not something that is cleanly definable. The value of information is far from tangible. But why? To answer requires turning to the second major difference: how to obtain what is expected.

In the case of nearly all large, complex industrial equipment except the automatic computer, business management and the equipment operators have an extensive background of skills to draw upon. But in the case of the automatic computer, there is little such background. Most industrial equipment, as, for example, large hydraulic presses or automatic transfer machines, involve only the traditional type of engineering concepts and skills, such as displacement, force, dimensions, speeds, and characteristics of materials. These are subjects that have been studied for many years; they are literally the mechanical arts which have been a field of human study, not for ten years or twenty, but literally for centuries.

In the case of automatic computer, however, we find that this situation does not exist. There is little background of study on the use of computers, because of the fact that computers themselves are young and because of the information factor discussed above. There has been no close parellel in history to this use of machines to do the information processing that traditionally has been done only by human beings. Here there are no centuries of experience to draw upon; there is little body of skills and knowledge which can be brought to bear.

From the point of view of the development of the computer industry, what does this lack of background of skills mean? It means, in my opinion, that the market potential of the industry is presently limited by the fact that many possible uses are not known as yet, let alone ways of carrying out such applications. When the simple conversion of existing data processing operations to computers has been completed—a task that is progressing well now—the sales of the industry will level off to amounts that reflect the replacement market and the basic growth of the national economy. This is obviously a number of years in the future, but, in my opinion, it appears to be the shape of that future.

FUTURE CAPACITY OF COMPUTER

It seems clear to most observers of the industry that the automatic computer has the capability of doing far more than anyone is using it for at present. But we no not know exactly the limit on that capability or how to push the use of a computer more significantly toward the limit.

At present, the firms in the industry are doing little research on these basic user problems. Most research being financed and done in the industry is on design matters and on topics that can readily be applied as part of the technical support provided to customers. However, the need is not for "applied" research but for "basic" or "pure" research.

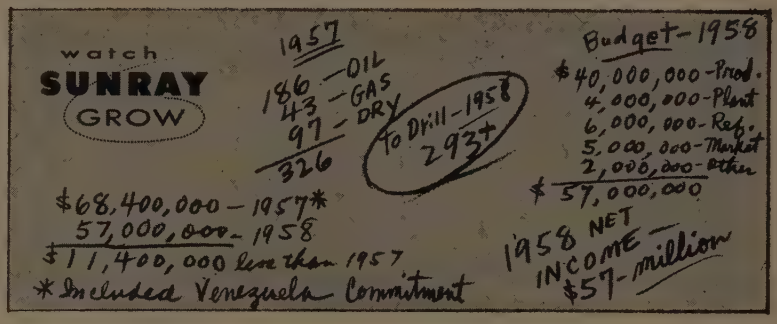
It is my feeling that the saturation level for the computer market cannot be lifted until a fundamental breakthrough occurs in the development of such knowledge and skills as a result of "basic" research. But to achieve a breakthrough will require investment in research now, in order to reap the benefits of it tomorrow. It can be argued that this research should be financed by the users of computers. But it is my feeling that, if this research be done at all to a significant degree, the financial burden will fall upon the firms in the computer industry—if only to secure a favorable future competitive position. Any investment in such basic research would only add to the capital needs of the firms in the computer industry without improving their earnings in the near future.

Drilling for Oil with a Budget

NOT MANY YEARS AGO an oil producing company would drill a well whenever it had the money and a lease. Sometimes the well came in with a good showing of oil. Other times the well might produce gas. Very often the well was dry.

LUCK WAS THE LADY drillers depended upon to bring them the favor of oil. Luck was good to many. An individual driller, with a few good wells and no dry holes prospered quickly. Soon a growing company would emerge from his drilling effort, with many individuals finding themselves with good employment. Many thousands of others became stockholders to share in this business of service and progress.

TO THOUSANDS OF OTHERS Lady Luck was a myth. After too many dry holes quite a few oil men were broke, and many a budding oil company closed its doors.



TODAY drilling for oil is much more scientific. There are many methods of surveying the land for possible oil or gas. Certainly, many dry holes are still drilled every year, but percentages are improving, especially in proven and semi-proven areas.

SUNRAY MID-CONTINENT maintains a large geological department. The company uses independent survey companies to plot leases before rigs are set up. The company also budgets money to be used for drilling at the start of each year. There is no hit or miss spending which might weaken the financial stability of the company. Forecasts, which have always proved to be very reliable, are made to determine the amount of production expected during each twelve months.

THIS YEAR Sunray set up an exploration and production budget for 1958 of approximately $46,000,000. For this money the company expects to get about 300 drilling completions, some oil, some gas and some dry holes. With this planned program Sunray is on safe ground and should end the year with the amount of new oil and gas production expected.

As Two Norwegians Saw the Train Trip

KAARE VARVIN and STEIN BERGH-JACOBSEN

IN A FEW YEARS' time we shall probably have digested most if not all of the mighty meal of facts, figures, and impressions set before us in the course of the Analysts Convention Tour held in the summer 1958.

To you Americans much of what we saw and experienced has been familiar as long as you can remember. Though you may not all have visited the places before, you had long known all about them, so that you were able to record in your mental diaries that "now we've been there", "that's the Grand Coulee—it's just like the pictures", "there we have the Chicago humpyards—looking just as they're said to look", and so on and so forth.

And ever since your early schooldays you have been accustomed to look upon private enterprise as the one and only—and natural-foundation of the country's economy. That is why it is only to be expected that you should be able to put searching questions about the state of a business and in reply receive a detailed and exhaustive set of answers. You wish to know how things are going in all these businesses, and whether they are being well or poorly run.

For us all of this was both novel and instructive.

We found that our knowledge of the American continent and the millions who inhabit it was far sketchier than we had been led to believe. Needless to say we were impressed by the vast expanses of farmland we saw in so many places; but as our train gnawed its way, hour after hour, day after day, into the parched and untilled plains, we were forced to wonder where the thirty per cent of the American continent, which, according to the statistics, is under cultivation, was to be found. This does not mean that we suspect the statistics of being wrong; but Mr. Jamison's account, when he spoke in Los Angeles, of how a calculation was made of the speed of the mourners who filed past Stalin's bier, has now and then returned to haunt our minds.

One thing that the statistics failed to tell us was that of the people we would meet, both in the most crowded of convention meetings and out in the wide open spaces, 100 per cent would be sincere, frank, and pleasant. The reception accorded us two lonesome foreigners wherever we went was not merely overwhelming but also, at times, flattering almost to the point of embarrassment, the more so as we had done nothing whatsoever to merit special attention of any kind.

In the course of the tour we learnt a great deal about American business, American industry, and the running of American railroads. We learnt, in fact, much more than we had expected, particularly on the last-mentioned subject,—but nevertheless there is no doubt in our mind that by far the most useful outcome of our journey was that we now feel we know and understand the American way of thinking and mode of life much, much better than formerly.

It is true that among the people we encountered there were some who feared we would run away with the idea that our present state of living was customary for Americans in general. We are fully aware that there is a difference; no one lives a normal life while traveling, and what is more, a tour like that undertaken by ourselves is not an everyday experience, even in the USA. Nor, perhaps, do people comport themselves at home as they do when away. But it would be a poor observer indeed who after having been together for so many days with such a representative section of a prominent class of people, gathered together from the length and breadth of the country, was not able to draw certain conclusions of general worth.

Going on from there, we must confess that much of what we formerly had tended to look upon as typically American has had to be discarded in the face of our recently revised opinions. We did not encounter a single person whose sole aim in life was to make a profitable deal no matter who got trampled underfoot in the process. We met no one who was determined to force his way in in any way. Finally, we never saw, perched on a bar stool, an American who, hat pushed onto the back of his head and a wad of gum firmly wedged in his cheek, held forth in a loud voice in defense of unassailable truths—all of which is the way Americans frequently picture themselves on the screen and are in turn depicted in European caricatures.

What we did find were shrewd but easy-going traveling companions all possessed of a store of well-considered opinions, but whose minds were always open to receive new impressions culled from newspapers and discussions alike. We ran into no glamour girls, but we did meet charming young ladies who claimed to be married and to have lots of children. We met married ladies, free of all makeup, whose leanings were towards the church (as whose are not, incidentally, in America?) And we met numerous employers—attentive, interested, quiet-mannered, charming people who gave the impression that it would be the death of them if they were forced to sack one of their employees.

We met none of the rough-tough characters we in Europe hear so much about. We did see workers who labored very hard indeed—not least among them two women at Weyerhauser in Portland, whose job it was to bind together lengths of timber—but more frequently we saw work being done at a rate which, though good and steady, was still not forced. We were considerably impressed by the tools and equipment at the disposal of each individual worker, especially in the automobile plants; but we were surprised to see how little the human element appeared to have been displaced by the machine.

The results of this policy were also to be observed in other fields. For example, many of the completely new industrial areas had been planned and developed in a manner which bears eloquent testimony to a deepfelt concern for human beings and the beauties of nature alike. We cannot conceive of its being possible to erect more attractive industrial plants than some of those we viewed on tour. Judging on the basis of our own straitened economic circum-

stances we find it difficult to believe that business principles are permitted to rule unopposed in the planning and construction of these modern plants. On the other hand such spacious and pleasant surroundings cannot fail to stimulate both factory and office workers to give of their best.

NEW AREAS

Generally speaking it was the developing of new areas which for us served to reconcile outmoded cliches relating to American push and drive with the scientifically minded, cultured development officers of today. We were, true enough, impressed by the vast humpyards of the railroads, but we must in all honesty acknowledge that we were still more impressed by the development work done by the railroads in the districts they serve. It would surprise us if part of the secret of America's prosperity is not to be found precisely in the tireless endeavours of the railroad companies to create new fields of opportunity for industry and agriculture in regions where they have not previously existed. The competition to be found among the railroads, too, be it good or bad, seems to us to have afforded considerable stimulus to American business.

We found it most interesting to study at close quarters the workings of free competition in practice. It cannot be denied that the United States also has its share of regulations and red tape, but it was readily apparent that wherever free competition was the order of the day, there too were to be found planning and orderliness. We wish to stress this point because on this side of the Atlantic the assertion is frequently made that free competition is synonymous with chaos and disorganization.

Apart from the foregoing, what, you may ask, impressed us most on this tour? Well—never shall we forget the descent by mule of the Grand Canyon; the ferry trip across San Francisco harbour was a wonderful experience; and the heat and astounding beauty of the desert will live for ever in our minds. Nor are we likely to forget in a hurry the singularity and unnaturalness of life in Las Vegas. From a tourist point of view, pride of place must without shadow of doubt go to the Yosemite—or perhaps Yose-might would be a better way of pronouncing it; but also the regions surrounding the Colombia River were of outstanding scenic beauty, despite the presence of man's handiwork in the form of giant power stations—in themselves imposing sights.

When all is said and done, however, the most valuable assets acquired on the tour were the many personal acquaintances we made, the many friends we gained. We look forward to seeing you all again, here in Oslo; and if you don't pay us a visit before long, there's a danger that one fine day we shall pack our bags and return to America to renew acquaintanceship.

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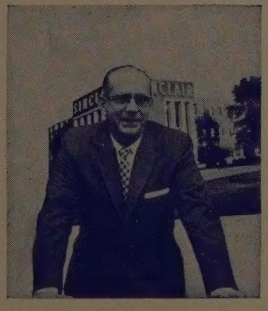

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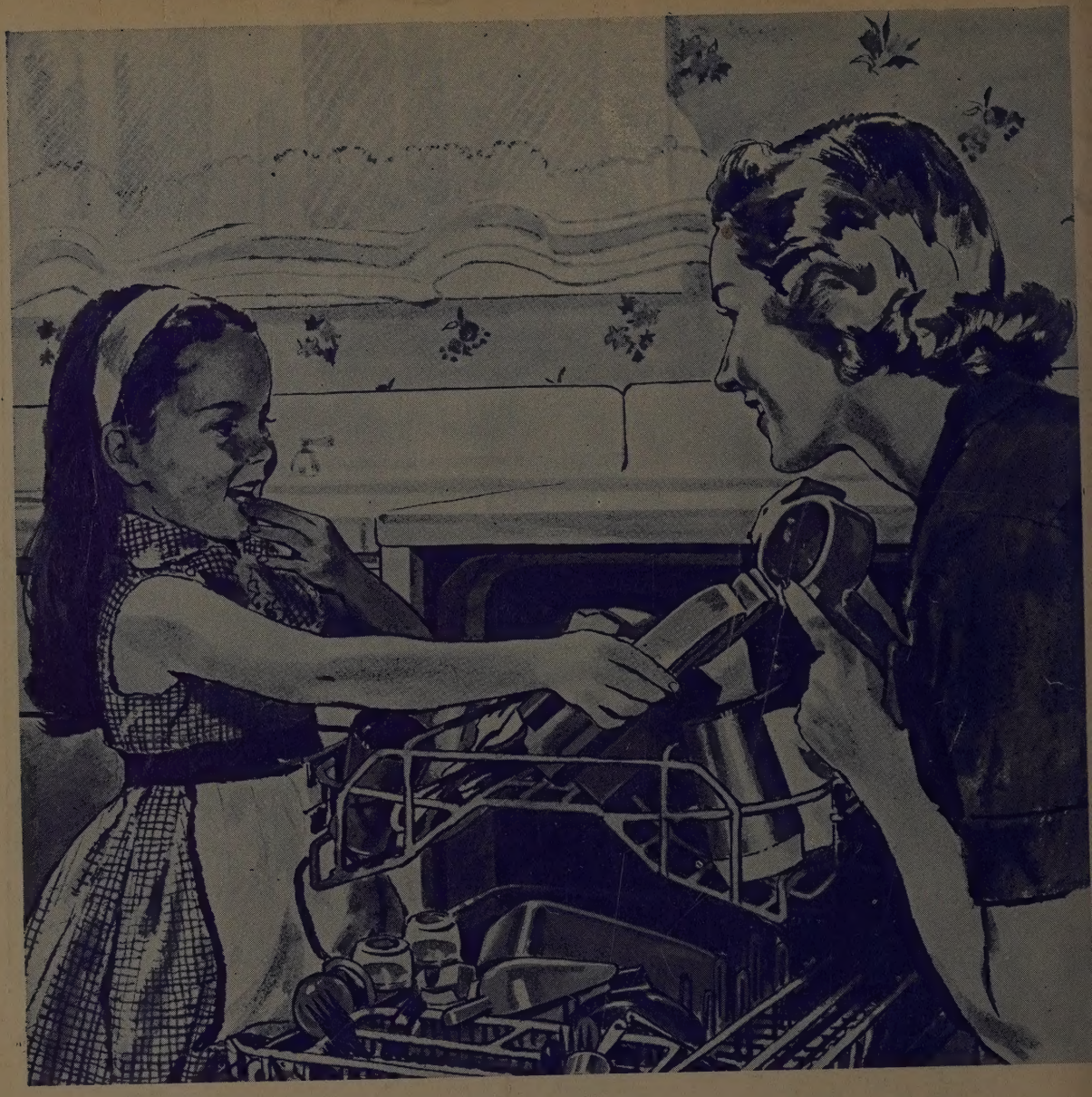

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